FINAL **November 2006**

FINAL INTEGRATED GENERAL REEVALUATION REPORT AND ENVIRONMNENTAL IMPACT STATEMENT

LOCK AND DAM 3 MISSISSIPPI RIVER NAVIGATION SAFETY AND EMBANKMENTS

St. Paul District
U.S. Army Corps of Engineers
190 Fifth Street East, Suite 401
St. Paul, Minnesota 55101

FINAL INTEGRATED
GENERAL REEVALUATION REPORT
AND
ENVIRONMNENTAL IMPACT STATEMENT

FOR

LOCK AND DAM 3 MISSISSIPPI RIVER
NAVIGATION SAFETY AND EMBANKMENTS

The responsible lead agency is the U.S. Army Corps of Engineers; the St. Paul District has the lead in preparation of this Integrated General Reevaluation Report and Environmental Impact Statement (GRR/EIS). There are no other official cooperating agencies.

ABSTRACT

Lock and Dam 3 is a navigation dam on the Upper Mississippi River 6 miles upriver from Red Wing, Minnesota, in Pierce County, Wisconsin, and Goodhue County, Minnesota. Lock and Dam 3 is a key part of the Upper Mississippi River 9-Foot Channel Navigation Project, authorized by Congress in the River and Harbor Act of 1927. The lock and dam was completed in 1938.

Two long-standing and related problems at Lock and Dam 3 involve navigation safety and the Wisconsin embankments. Because the dam was constructed on a bend in the river with the lock on the outside of the bend, an outdraft current sweeps across the upper lock approach toward the gated part of the dam. The outdraft current makes navigation difficult and has caused many navigation accidents. Since 1963, 11 accidents have occurred when tows collided with the gated part of the dam.

Lock and Dam 3 was constructed with a unique set of embankments on the Wisconsin side to maintain water levels in two floodplain lakes. The Wisconsin embankments were not constructed to modern standards of engineering design. They consist of a series of sheet pile and rock weirs called spot dikes, natural river levees, and some segments of constructed earthen embankments. The Wisconsin embankments have deteriorated over the years and are vulnerable to failure.

Navigation accidents can result in barges blocking one or more of the four roller gates in the dam, resulting in a rise in water level in navigation Pool 3 and increased flow over the Wisconsin embankments when there is head at the dam, creating a highly erosive situation. The Wisconsin embankments could fail rapidly because of the weak soil conditions in that area, opening up a scour channel around Lock and Dam 3 that would cause an accidental drawdown of Pool 3.

An accidental drawdown of Pool 3 would have significant adverse economic and environmental consequences. Navigation would be closed, erosion would destroy high quality wetland habitat in the Gantenbein Lakes area, 2,500 acres of shallow aquatic habitat and wetlands in Pool 3 would be dewatered, infrastructure at the Prairie Island Indian Community marina would be damaged, and two large power plants on Pool 3 would be forced to shut down.

Through a planning process with input from stakeholders, the Corps has identified a tentatively recommended plan to improve navigation safety and the Wisconsin embankments at Lock and Dam 3. The plan would include an extended guide wall with channel modifications and strengthened embankments with phased construction.

The navigation safety and embankments plan includes the following:

Extended guide wall and channel modifications:

The existing landward guide wall on the upstream side of the lock would be extended 862 feet. A pile-supported concrete wall would be constructed with a continuous concrete rubbing surface extending 3 feet below normal pool level, and a concrete panel would hang 8 feet below that to control crosscurrents along the wall. The guide wall would have bollards to tie off barges, lights, signage and access. At the upstream end of the wall, a 50-foot-diameter concrete filled steel sheet pile cell would protect the end of the wall from direct collisions. The sheet pile cell would have a navigation light, power, access, and signage. The estimated construction cost of the extended guide wall and channel modifications is $30,227,000.

As an interim measure until an extended guide wall and channel modifications are constructed, the St. Paul District will pursue complete voluntary compliance by the towing industry for helper boat use during outdraft conditions (river discharge greater than 21,000 cfs) for down bound tows approaching Lock and Dam 3 with six or more loaded barges.

Strengthened Wisconsin embankments with phased construction:

In Phase 1 of the embankments construction, the overflow weirs called spot dikes along the upper embankment would be rebuilt. New sheet pile would be driven at the spot dikes, offset about 15 feet from the old sheet pile. Rock riprap in the overflow channels of the spot dikes would be placed and keyed into the surrounding grade. Low areas that have scoured along the upper embankment would be filled. One or two additional spot dikes would be constructed in larger existing scour channels, and a 10-foot-wide access trail of crushed rock along the upper embankment would be constructed to enable access for construction and later inspections and maintenance activities. The old Marsh Lake inlet culvert at spot dike D would be replaced.

A raised 400-foot-long embankment near the dam would be constructed to protect the gated part of the dam. A 400-foot-long Marsh Lake spillway would be constructed. The old Marsh Lake water control structures would be replaced with a new stoplog culvert water control structure. A 2,100-foot-long spillway between Gantenbein Lake and the river would be constructed, and a stoplog culvert Gantenbein Lake water control structure would be built.

The spillways would be constructed with articulated concrete mat (ACM), keyed into grade with rock on the upstream side and underwater downstream toe. The ACM spillways and areas disturbed by construction would be planted with sandbar willow and other native flood-tolerant wetland plants.

The Phase 1 embankments construction would leave the wider land area between the Marsh Lake and Gantenbein Lakes spillways unprotected, along with the area from downstream end of

the Gantenbein Lake spillway around the south end of Gantenbein Lake to the bluff. The embankments would be inspected regularly and after overtopping events. If breaches through the unprotected areas were to occur, additional segments of the lower embankment would be built as needed in Phase 2 construction. In the event of the need for Phase 2 construction around the south end of Gantenbein Lake, an access trail for light trucks and personnel would be extended from the existing trail around the south end of Gantenbein Lake to the end of the Gantenbein Lake spillway.

The estimated cost of embankments construction is $33,644,000. Of that total, the estimated cost of Phase 2 construction, if needed in the future, would be $5,329,000.

Environmental mitigation:

Environmental mitigation features for the embankments construction include design features to avoid and minimize adverse effects of project construction. Compensatory mitigation for unavoidable impacts of construction on floodplain forest would include acquisition and restoration of 313 acres of floodplain forest habitat in Pierce County. Real estate acquisition and floodplain forest restoration costs for environmental mitigation are included as first costs of the project. The mitigation real estate acquisition and restoration work would be done before or concurrently with project construction. The estimated cost of real estate acquisition for environmental mitigation is $1,512,000. The estimated cost of floodplain forest restoration on the mitigation land is $256,000.

The combined project is estimated to cost $63,871,000 to construct. The tentatively recommended plan would contribute to the national economic development, have an annualized net benefit of $4,451,450, and would have a benefit-cost ratio of 2.09.

The project would meet the planning objectives of improving navigation safety and strengthening the Wisconsin embankments. The project would also meet the planning objective of protecting the river environment by minimizing construction impacts on river and floodplain habitats, mitigating unavoidable impacts and reducing the risk of adverse environmental effects of navigation accidents, embankment failure and accidental drawdown of Pool 3.

The cost of construction and environmental mitigation would be 100-percent Federal, paid 50 percent each from the general fund of the U.S. Treasury, through the Corps of Engineers Operation and Maintenance budget, and the Inland Waterways Trust Fund. Operation and maintenance of the project and phase 2 of embankments construction, if needed, would be accomplished through the Corps of Engineers Operations and Maintenance budget.

The Draft Integrated Reevaluation Report and Environmental Impact Statement was distributed for agency and public review on August 18, 2006. The end of the comment period was October 6. This final report and EIS contains comments that we received from stakeholders and our responses to the comments. We made changes to the draft report in response to reviewer comments that are reflected in this final report and EIS. **Please provide written comments by January 12, 2007,** to the St. Paul District, U.S. Army Corps of Engineers, ATTN: Mr. Daniel Wilcox, CEMVP-PM-E, 190 Fifth Street East, Suite 401, St. Paul, Minnesota 55101, or by email: Daniel.B.Wilcox@usace.army.mil.

The St. Paul District will compile the comments, prepare written responses and will forward them and the final report and EIS to the Commander, Mississippi Valley Division, U.S. Army Corps of Engineers in Vicksburg Mississippi. The Division Commander will take the

recommendations in this report under consideration and will sign a Record of Decision about the Lock and Dam 3 Navigation Safety and Embankments project.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDIXES

SUMMARY

Purpose

This Draft Integrated General Reevaluation Report and Environmental Impact Statement (EIS) is about a proposed project to reduce related navigation safety and embankment problems at Lock and Dam 3, a navigation dam on the Upper Mississippi River near Red Wing, Minnesota. This report integrates the Corps of Engineers decision document and the National Environmental Policy Act (NEPA) and Clean Water Act documents to avoid duplication and to consolidate information for reviewers.

Need for Action

Lock and Dam 3 was constructed on a bend in the river and with an experimental set of embankments on the Wisconsin side to avoid inundating areas of high quality floodplain wetland habitat. The location on a bend in the river resulted in a severe outdraft current that flows across the upstream lock approach toward the gated part of the dam. This outdraft current makes down bound navigation difficult for commercial tows. Many navigation accidents have occurred with barges colliding with the dam.

The Wisconsin embankments are a combination of natural river levee low ground, constructed sheet pile weirs called spot dikes, and constructed embankments. The Wisconsin embankments are deteriorating and are vulnerable to failure. Most were not constructed to modern engineering design standards. A navigation accident could result in overtopping of the Wisconsin embankments when a head exists at the dam, leading to embankment failure, a new channel forming around the dam and an accidental drawdown of Pool 3. Such a drawdown would have severe environmental and economic consequences, including closing navigation and forcing the shutdown of two large power plants. Lock and Dam 3 is the most physically vulnerable navigation dam of the Upper Mississippi River 9-Foot Channel Navigation Project. The need is to improve navigation safety and strengthen the Wisconsin embankments at Lock and Dam 3.

Study Process

This general reevaluation study followed the standard Corps of Engineers six-step planning process:

1. Identify problems, needs, opportunities and constraints.
2. Inventory and forecast future conditions.
3. Formulate alternatives.
4. Evaluate alternatives.
5. Compare alternatives.
6. Select a recommended plan.

This study has also followed the substantive and procedural requirements of the NEPA guidelines for an EIS.

Proposed Actions

A combination project is proposed to address the related navigation safety and embankment problems at Lock and Dam 3. An extended landward guide wall and channel modifications are proposed to reduce the outdraft problem and improve navigation safety. The Wisconsin embankments are also proposed to be strengthened. The first phase of embankment construction would include rebuilding the spot dikes, raising the embankments near the gated part of the dam and constructing two low overflow spillways. The second phase of embankment construction would be to construct a low embankment between the overflow spillways and extending to high ground downstream of Lock and Dam 3. This second phase of embankment construction would be done if the areas remaining unprotected following Phase 1 construction were breached.

Environmental mitigation is proposed to compensate for both Phase 1 and future Phase 2 embankment construction impacts on floodplain forest wetlands and channel border aquatic habitat. The mitigation plan calls for purchase of 313 acres of floodplain wetland area that is presently in agricultural use in Pierce County, Wisconsin, and planting native floodplain forest trees. The environmental mitigation land acquisition and floodplain forest restoration work would be done concurrently with project construction. Cost of the environmental mitigation is included in the total project cost. The mitigation land would remain in Federal ownership. If the Wisconsin Department of Natural Resources (WDNR) is willing to manage the property, the St. Paul District and the WDNR would enter into a real estate outgrant agreement for use of the mitigation property as a wildlife management area.

The proposed project would cost $63,871,000. The estimated benefit-cost ratio (BCR) is 2.10. The project would be constructed in 3 years.

Areas of Controversy

Controversy existed about a plan proposed in 1999 for strengthening the Wisconsin embankments. That project would have had adverse impacts on a species-rich mussel bed in the tailwater downstream of Lock and Dam 3 and would have had a relatively large construction footprint in an area of floodplain forest. The tentatively recommended plan described in this report for strengthening the Wisconsin embankments would avoid disturbing the mussel bed in the tailwater area and would have a smaller construction footprint than the project proposed in 1999. The phased construction of the Wisconsin embankments in the current plan would also reduce construction impacts by leaving parts of the lower embankment area undisturbed until it becomes necessary to complete construction.

Unresolved Issues

Opportunity exists to construct a fishway to allow passage of native migratory fish through Lock and Dam 3. Construction of a fishway in conjunction with an embankments project could result in cost savings over constructing a fishway separately. This general reevaluation study and the tentatively recommended project to improve navigation safety and embankments are being cost-shared on a 50-50 basis with the Inland Waterways Trust Fund, which was designated by Congress for navigation system improvements, not for ecosystem

restoration measures. The St. Paul District does not currently have authority or a funding source for an ecosystem restoration project at Lock and Dam 3. For these reasons, a fishway is not included as part of this lock and dam rehabilitation project.

It may be possible to incorporate a fishway into the embankments construction at Lock and Dam 3 if it can be funded under new congressional authorization with appropriations to implement ecosystem restoration recommendations of the Upper Mississippi-Illinois Waterway Navigation Feasibility Study.

Relationship to Environmental Protection Laws and Regulations

This general reevaluation of an existing project has been conducted according to Corps of Engineers planning guidance (ER 1105-2-100) and NEPA regulation (ER 200-2-2) in compliance with Federal and State laws and regulations. Section 7 of this report and EIS provides a detailed description of the relationship of the planning process and proposed action to environmental protection laws and regulations.

Participating Agencies and Organizations

A number of agencies and organizations have participated in the reevaluation study, including:

Wisconsin Department of Natural Resources (WDNR)
Wisconsin Department of Transportation (WDOT)
Minnesota Department of Natural Resources (MDNR)
Minnesota Department of Transportation (MDOT)
Minnesota Pollution Control Agency (MPCA)
U.S. Fish and Wildlife Service (USFWS)
U.S. Coast Guard (USCG)
U.S. Geological Survey (USGS)
River Industry Action Committee (RIAC)
Upper Mississippi River Waterways Association (UMRWA)
Prairie Island Indian Community
Xcel Energy, Inc.
Audubon Society
Sierra Club
Isaak Walton League
Red Wing Wildlife League
Trimbelle Sportsmans Club
Diamond Bluff Associates

This page intentionally left blank.

CHAPTER 1. BACKGROUND

1.1 Study Purpose

This Final Integrated General Reevaluation Report and EIS documents a planning process to address related navigation safety and embankment problems at a navigation dam on the Upper Mississippi River. This report integrates the Corps of Engineers decision document and the NEPA and Clean Water Act documents to avoid duplication and to consolidate information for reviewers.

1.2 Study Location

Lock and Dam 3 is at Upper Mississippi River mile 797, about 41 miles downriver from St. Paul, Minnesota, and 6 miles upriver from Red Wing, Minnesota (Figure 1-1). The navigation pool formed by the lock and dam (Pool 3) extends 18.3 miles upstream to Lock and Dam 2 at Hastings, Minnesota, and approximately 24.5 miles up the St. Croix River, which is the only major tributary entering the pool. The section of Pool 3 that extends up to Lock and Dam 2 provides waterway access to St. Paul and Minneapolis, Minnesota. Lock and Dam 3 is in Goodhue County, Minnesota, and Pierce County, Wisconsin.

1.3 Need for Action

Lock and Dam 3 was constructed on a bend in the river and with an experimental set of embankments on the Wisconsin side to avoid inundating areas of high quality floodplain wetland habitat in the Cannon River Bottoms in Minnesota and the Gantenbein Lakes area in Wisconsin. The location on a bend in the river resulted in an outdraft current that flows across the upstream lock approach toward the gated part of the dam. The outdraft current makes down bound navigation difficult for commercial tows. Many navigation accidents have occurred when barges have collided with the dam.

The Wisconsin embankments are a combination of natural river levee low ground, sheet pile weirs called spot dikes, and filled areas. Most of the embankment system was not built to modern standards of engineering design and has been deteriorating since the dam was completed in 1938 despite a series of repairs. As the embankments deteriorated over time, the frequency and size of emergency repairs have increased. In the 1990s, erosion of the embankments reached a critical point where the land mass that once separated Marsh and Gantenbein Lakes from the river eroded away, and breaches formed in the remaining narrow land mass. Some parts of the lower embankment are now only a few feet wide; other parts consist only of rock that was placed during emergency repairs.

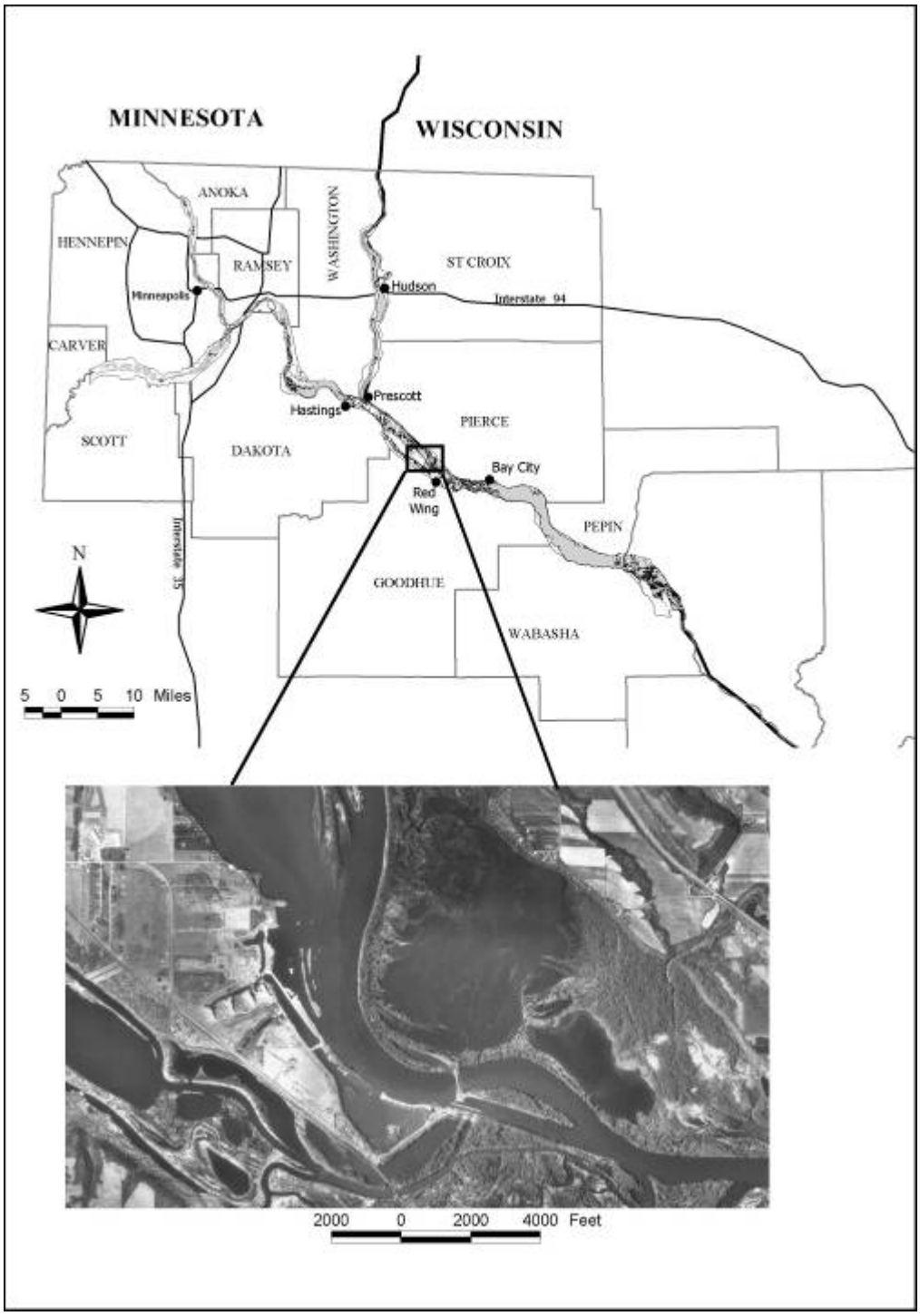


Figure 1-1. Location of Lock and Dam 3, Upper Mississippi River

If a barge collides with the dam, the upstream edge of a pier can damage the barge causing it to sink, resulting in high local velocities that can put the movable dam itself at risk unless the roller gates for the affected bays are closed. Lock and Dam 3 has only four roller gates; closing even one or two roller gates can have a significant effect on water levels in the navigation pool. During a navigation accident in 1993 when barges collided with the gated part of the dam and sank, closing the roller gates resulted in significant stage increase in the upstream pool. Navigation accidents can cause overtopping of the Wisconsin embankments

when a head exists at the dam, leading to failure of the earthen embankments, development of a scour channel around the gated part of Lock and Dam 3, and an accidental drawdown of Pool 3. An accidental drawdown of Pool 3 would have severe environmental and economic consequences, including closing navigation and forcing the shutdown of two large power plants.

Lock and Dam 3 is the most physically vulnerable navigation dam of the Upper Mississippi River 9-Foot Channel Navigation Project. The need is to improve navigation safety and to strengthen the Wisconsin embankments at Lock and Dam 3.

1.4 Authorities

The River and Harbor Act of January 21, 1927, authorized a survey of the Mississippi River between the Missouri River and Minneapolis to determine the feasibility of a 9-foot navigation channel. The Secretary of War transmitted a report from the Chief of Engineers to Congress about this survey in House Document 290, 71st Congress, 2nd session. The report served as a basis for authorization for construction and subsequent operation and maintenance of Lock and Dam 3 in the River and Harbor Act of July 3, 1930. The portion of the act authorizing the Upper Mississippi River 9-Foot Channel Navigation Project follows:

> Mississippi River between mouth of Illinois River and Minneapolis: The existing project is hereby modified so as to provide a channel depth of nine feet at low water with widths suitable for long-haul common-carrier service, to be prosecuted in accordance with the plan for a comprehensive project to procure a channel of nine-foot depth, submitted in House Document 290, Seventy-first Congress, second session; and the sum of $7,500,000 in addition to the amounts authorized under existing projects is hereby authorized to be appropriated for the prosecution of initial works under the modified project: Provided, That all locks below the Twin City Dam shall be of not less than the Ohio River standard dimensions.

Corps of Engineers regulation ER-1165-2-119 states that it is the general policy of the Chief of Engineers that completed Corps projects be observed and monitored by the Corps to ascertain whether they continue to function in a satisfactory manner and whether potential exists for better serving the public interest…Whenever reporting officers find that changes in a completed project may be desirable, investigations should be undertaken to document the need for and feasibility of project modification. To the extent possible, modifications to completed projects should be accomplished under existing authorities. Section 216 of the Flood Control Act of 1970 (Public Law 91-611) states:

> The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest.

This study and any modifications to improve navigation safety and the integrity of the embankments at Lock and Dam 3 are authorized under the original project authorization and Section 216 of the Flood Control Act of 1970. The authorizing documents contain no local cooperation or non-Federal cost share requirements. Cost of this general reevaluation and improvements to Lock and Dam 3 will be cost-shared 50-50 with the Inland Waterway Trust Fund as required by Title 33 USC, Chapter 32.

Corps of Engineers regulation ER 1105-2-100, Appendix G, Amendment No.1, 30 June 2004, defines the project approval authority delegated to the Division Commander. Division commanders may approve changes to authorized projects, or elements thereof, if such changes meet certain criteria. The modifications recommended for Lock and Dam 3 would be done under the original project authorization and Section 216 of the Flood Control Act of 1970. The recommended modifications would not increase or decrease the scope of the project (for example, storage capacity, outputs, environmental impacts) originally authorized by Congress. The recommended modifications would not change the location or substantially change the design of the project. The environmental impacts of the recommended modifications would be minor in comparison to the impacts of original project construction, and the recommended modifications would not add or delete a project purpose.

1.5 Prior Studies, Reports, and Existing Water Resource Projects

Lock and Dam 3 was constructed between August 1935 and March 1938. The project was placed in operation on July 21, 1938. Pertinent data about Lock and Dam 3 are shown in Table 1-1.

Lock and Dam 3 underwent major rehabilitation from 1988 through 1991. About 900 commercial tows and 20,000 recreational boats pass through the lock each year.

A guide wall extension was designed in the 1940s, presumably to address an outdraft problem that was apparent soon after the lock and dam was placed in operation. The St. Paul District has been studying the related problems with navigation safety and the Wisconsin embankments at Lock and Dam 3 since the 1970's.

The U.S. Army Engineer Waterways Experiment Station (WES, now named the U.S. Army Engineer Research and Development Center (ERDC)) constructed a physical hydraulic model of the Mississippi River at Lock and Dam 3 and simulated alternatives to improve navigation safety for the St. Paul District (Shows and Franco 1979).

When WES conducted the model study of the lock approach, two sheet-pile mooring cells were in place in the channel border along the right bank upstream of the lock. The upstream cell was damaged in a collision with a tow in April 1983. The other cell was damaged in a collision with a tow in March 1991. The damaged mooring cells were removed. The mooring cells were not found to contribute to navigation safety and have not been replaced.

Table 1-1. Pertinent data about Lock and Dam 3

Authorization	July 3, 1930, River and Harbor Act
Purpose	Navigation, 9-Foot Channel Navigation Project
Location	Mississippi River mile 797, 6 miles upriver from Red Wing, Minnesota
Drainage area	45,170 square miles
Pool area	17,950 acres
Pool length (to Lock and Dam 2)	18.3 miles
Project pool elevation	675.0 feet msl (1912 adjustment)
Normal tailwater elevation	667.0 feet msl
Maximum head at dam, lift in lock	8 feet
Minimum river discharge	1380 cfs (cubic feet per second, 1940)
Maximum river discharge	230,000 cfs (1965)
Average daily discharge	16,200 cfs
Maximum stage at dam	688.2 feet msl (1965)
Main lock length	600 feet
Main lock width	110 feet
Elevation top of lock wall	686.0 feet msl
Pool elevation at which lock machinery must be removed	683.0 feet msl
Auxiliary lock	Not complete
Movable dam gates	Four 80-foot-wide roller gates
Embankments – Minnesota side	Homogeneous rolled earthfill, 1,000 feet long, elevation 686.0 feet msl, five sheet-pile spot dikes, 650 feet total
Embankments – Wisconsin side	Upper embankment sheet-pile spot dikes B through J, 1,900 feet total Earthfill and natural low ground, 3,972 feet total

A navigation safety study (Corps of Engineers 1988) was conducted using results of the WES physical hydraulic model study. The St. Paul District then recommended construction of a 1,250-foot-long rock jetty extending upstream from the intermediate lock wall and 260,000 cubic yards (cy) of dredging in the main channel upstream of the dam. Dredged material was to be placed on Prairie Island Indian Community land. First cost of construction was estimated to be $4,100,000. That project was not funded through the Corps Operations and Maintenance budget.

In a revised navigation safety study (Corps of Engineers 1990), the St. Paul District recommended a 1,340-foot-long rock jetty and 260,000 cy of excavation in the main channel, with placement of dredged material at a different location on Prairie Island than proposed in 1988. First cost of construction was estimated to be $5,927,000. That project was not funded through the Corps Operation and Maintenance budget.

A study of submerged bendway weirs as an alternative to improve navigation safety was conducted in 1991. The Corps of Engineers, St. Louis District, conducted the study using two-dimensional numerical hydraulic modeling. Bendway weirs were eliminated from further consideration by an adverse review by WES (Exhibit E, Appendix J, in Corps of Engineers 1995a).

The St. Paul District proposed and Corps of Engineers Headquarters approved two projects to address concerns about navigation safety and embankments at Lock and Dam 3 in 1995 (Corps of Engineers 1995a and U.S. Army Corps of Engineers 1995b). A 1,230-foot-long ported guard wall and 86,400 cy of channel excavation were proposed to improve navigation safety. The estimated first cost of construction was $11,993,000. That project was not funded through the Corps of Engineers Operations and Maintenance budget. The ported guard wall alternative has been included as an alternative in this reevaluation.

In 1994, the St. Paul District recommended constructing a single overflow spillway, following an alignment along the intermediate embankment between Marsh and Gantenbein Lakes (Corps of Engineers 1995b). Additionally, the Wisconsin spot dikes (upper embankment) are vulnerable to erosion from overtopping and under seepage if the elevation of Marsh Lake is 1.5 feet lower than the elevation of Pool 3. This vulnerability is greatly increased if the privately-owned intermediate and lower embankments fail and the tailwater below the spot dikes is lowered. Breaching of the spot dikes could result in an accidental drawdown of Pool 3 with subsequent disruption of navigation, shutdown of two large power plants, and adverse environmental impacts. The St. Paul District recommended the project to reinforce the intermediate dike so that it could maintain Pool 3 at project pool level of 675.0 feet above mean sea level (msl) without relying on either the spot dikes or the lower embankment.

Potential scour of the embankments was analyzed in December 1997. The analysis demonstrated that significant scour could occur below the intermediate embankment project recommended in the 1995 report. The plan recommended in the 1995 report was not designed for the depth of scour anticipated by the scour analysis.

Plans and specifications for an initial phase of construction of the Lock and Dam 3 embankments project were completed in July 1998. A value engineering review and general design memorandum (Corps of Engineers 1999) recommended reconstructing the lower embankment along the river. The initial phase of construction consisted of raising the elevation of spot dike A with a concrete floodwall immediately next to the dam to prevent overtopping during large floods. The construction contract for the initial phase was awarded in September 1998; that construction was completed in June 1999.

A species-rich mussel bed was found in the tailwater within the construction impact zone of the proposed embankment project. Regulatory agencies opposed the embankment project, and the St. Paul District could not obtain State water quality certification for the project as required under Section 401 of the Clean Water Act. This situation put the project on hold. In an effort to address the related navigation safety and embankment concerns at Lock and Dam 3, the St. Paul District began this general reevaluation in May 2000.

The Upper Mississippi River - Illinois Waterway Navigation Feasibility Study Integrated Feasibility Report and Programmatic Environmental Impact Statement (Corps of Engineers 2004) recommended an integrated plan for a 50-year framework for management of the Upper Mississippi River - Illinois Waterway navigation system and the river ecosystem. In that study, the Corps examined alternatives for improving efficiency (lock transit time for commercial tows) of the navigation system. Because existing and projected future traffic at Lock and Dam 3 fall within the capacity of Lock and 3, no navigation efficiency improvement measures were proposed for Lock and Dam 3. This General Reevaluation Report for Lock and Dam 3 does not identify any need or measures for improving navigation efficiency at Lock and Dam 3. Ecosystem restoration measures were identified in the navigation study report for Lock and Dam 3, including fish passage improvement and other measures in Pools 3 and 4 of the Upper Mississippi River.

In 2005, Lock and Dam 3 was included in the Screening Portfolio for Risk Assessment of Dams (SPRA), a Corps of Engineers effort to identify high risk dams. Lock and Dam 3 was ranked number 2 nationally among navigation projects with the highest risk of failure. The SPRA noted that Lock and Dam 3 ranked highly vulnerable because of the deteriorated condition of the Wisconsin embankments and the significant adverse environmental and economic consequences of embankments failure and an accidental drawdown of Pool 3.

In March 2006, the USCG, the RIAC, and the Corps of Engineers completed an Upper Mississippi River Annex to the Upper Mississippi River and Tributaries Waterways Action Plan. The annex is available to read on-line from the USCG Mississippi River Sector web site at: http://www.uscg.mil/d8/sector/umr/wap.html

This page intentionally left blank.

CHAPTER 2. PLANNING PROCESS

This general reevaluation report and EIS documents a planning process that began in May 2000 to resolve long-standing and related problems at Lock and Dam 3. The planning process has six steps and follows Corps of Engineers planning guidance (Corps of Engineers 2000a):

1. Identify problems, needs, opportunities and constraints.

2. Inventory existing conditions and forecast future conditions.

3. Formulate alternative plans.

4. Evaluate alternative plans.

5. Compare alternative plans.

6. Select the recommended plan.

This report is organized around these steps of the planning process.

2.1 Study Management

This study is being managed by the St. Paul District, U.S. Army Corps of Engineers, with funding and policy guidance through the Mississippi Valley Division, U.S. Army Corps of Engineers, Vicksburg, Mississippi. The Division Commander will decide about the actions recommended in this report and will sign a record of decision (ROD).

The project delivery team (PDT) is an experienced and interdisciplinary group of St. Paul District engineers, scientists, economists, real estate and public affairs specialists, and attorneys (see list of preparers in section 11 below).

2.2 Study Participants

This study has been conducted with considerable input from interested agencies, conservation organizations, industry, the Prairie Island Indian Community and the public. At the outset of the study in May 2000, the St. Paul District invited interested stakeholders to participate with the Corps PDT in the planning process. A series of planning workshops were held in St. Paul, at Lock and Dam 3, Red Wing, Lake City, and Frontenac, Minnesota. A number of agencies and organizations have participated in the planning process, including the following:

Wisconsin Department of Natural Resources (WDNR)
Wisconsin Department of Transportation (WisDOT)
Minnesota Department of Natural Resources (MnDNR)
Minnesota Department of Transportation (Mn/DOT)
Minnesota Pollution Control Agency (MPCA)
Minnesota – Wisconsin Boundary Area Commission
Upper Mississippi River Citizens Commission

U.S. Fish and Wildlife Service (USFWS)
U.S. Coast Guard (USCG)
U.S. Geological Survey (USGS)
River Industry Action Committee (RIAC)
Upper Mississippi River Waterways Association
Prairie Island Indian Community
Upper Mississippi River Citizen Commission
Xcel Energy, Inc.
The Audubon Society
Sierra Club
Isaak Walton League
Red Wing Wildlife League
Trimbelle Sportsmans Club
Diamond Bluff Associates

2.3 Study Schedule and Cost

The reevaluation study began in May 2000. Funding constraints in 2002 through 2005 interrupted study progress. No funding for the study was available for much of 2004 and 2005. With a congressional appropriation in late 2005, the study resumed. The study has cost approximately $2,220,000 to date.

2.4 Coordination and Public Involvement

This general reevaluation study was initiated in May 2000 to resolve difficult and related problems with navigation safety and embankments at Lock and Dam 3 and to address stakeholders concerns about participation in the planning process. A Notice of Intent to prepare and EIS was published in the Federal Register on August 31, 2000 (see Appendix A).

A series of meetings with stakeholders and the general public was held to gain input into the planning process and to keep interested agencies, organizations and the public informed about the study. The WDNR, MnDNR, MPCA, USFWS, and landowners (Diamond Bluff Associates) actively participated in the planning process. The USCG and the river towing industry (represented by the RIAC, the Upper Mississippi River Waterways Association and towboat pilots) provided valuable insight into ways to improve navigation safety.

The Corps PDT met with stakeholders in May and August 2000 to determine the study scope, identify the purpose and need for the study, identify the geographic extent of the study area, identify issues of concern, and set objectives.

The Corps PDT and stakeholders met in December 2000 to screen alternatives. A public meeting was held in Red Wing on February 6, 2001. The meeting was hosted and facilitated by the Minnesota-Wisconsin Boundary Area Commission. The Corps PDT and stakeholders met again on April 16, 2001, to formulate alternative plans. Further team meetings in 2002 through 2005 led to the final set of alternative plans considered in detail in the General Reevaluation Report and EIS.

2.4.1 Planning Meetings with Interested Agencies and Organizations

May 17, 2000	Initial meeting of combined reevaluation study, NEPA scoping, project objectives.
August 30, 2000	NEPA scoping, objectives, alternatives, risk and benefit-cost analysis
December 6, 2000	Helper boat use, alternatives screening
April 16, 2001	Plan formulation, helper boat use
September 26, 2001	Environmental impact assessment, embankments area site visit
June 6, 2002	Alternatives formulation, risk and benefit-cost analyses
August 29, 2002	Embankments alternatives designs, results of risk and benefit-cost analyses
November 4, 2002	Embankments area site visit
November 21, 2002	Alternatives comparison, results of risk and benefit-cost analyses
July 22, 2003	Embankments design alternatives
January 6, 2006	Resumed study schedule, proposed project features
October 24, 2006	Meeting with agencies to discuss comments on draft report

2.4.2 Meetings with the USCG and Towing Industry

February 5, 2001	Helper boat use
August 13, 2001	Helper boat use, USCG policy and regulations
August 29, 2001	Helper boat use, navigation improvement alternatives
January 30, 2002	Hydraulic modeling, navigation improvement alternatives
January 16, 2003	Navigation improvement alternatives

2.4.3 Public Meetings

Public meetings about the Lock and Dam 3 project were held at the Red Wing Minnesota Public Library.

February 6, 2001
February 8, 2006
September 6, 2006

2.4.4 News Releases

A series of news releases about the study were provided to the local media (Red Wing and Ellsworth, Wisconsin, newspapers and radio stations) and in advance of the public meetings. The project manager gave a number of interviews to radio stations, newspapers and magazines.

2.5 Scoping Process

Scoping is a process conducted at the outset of preparing a Federal EIS. An EIS was determined to be necessary to document the planning and decision process for modifications to Lock and Dam 3. Scoping is required by NEPA, Regulations for Implementing the Procedural Provisions of NEPA (Council of Environmental Quality guidelines, 40 CFR Parts 1500 – 1508), and by Corps of Engineers regulation ER200-2-2, Procedures for Implementing NEPA.

Scoping is primarily intended to focus the EIS, determine the study area, identify the issues to be addressed and identify the significant resources that might be affected by a proposed action. The NEPA scoping document is based on discussions by the Corps PDT and stakeholders.

2.6 Study Scope

The study area includes the area and resources that may be affected by modifications to Lock and Dam 3. It includes upper Pool 4 and Pool 3, extending along the Mississippi River from Red Wing to Hastings and up the St. Croix River to Stillwater, Minnesota. Marsh and Gantenbein Lakes and the adjacent floodplain on the Wisconsin side of Lock and Dam 3 are part of the study area.

The study is about an existing navigation project and is limited to improvements to Lock and Dam 3 relating to existing problems with navigation safety and the integrity of the Wisconsin embankments.

Because the study and any improvements are being cost-shared with the Inland Waterway Trust Fund, ecosystem restoration features are not proposed for inclusion in the navigation safety and embankments project. Opportunities for ecosystem management and restoration in the vicinity of Lock and Dam 3 exist under other Corps and State programs.

2.7 Significant Resources

Significant resources in the study area include natural and cultural resources that are recognized as significant by institutions and the public. The significance of resources is based on both monetary and non-monetary values. Monetary value is based on the contribution of the resources to the Nation's economy. Non-monetary value is based on technical, institutional or public recognition of the ecological, cultural, and aesthetic attributes of resources in the study area. The scientific community and natural resources management agencies recognize the technical significance of resources. Through discussion with stakeholders and study participants, the following significant resources in the study area were identified.

Significant infrastructure features in the project area include the following:

- Lock and Dam 3, the lock, movable dam, embankments
- Navigation channel, channel training structures and navigation aids
- Prairie Island Nuclear Power Plant
- Allen S. King Power Plant (on the St. Croix River)
- Prairie Island Indian Community
- Prairie Island Resort, Casino, and Marina

Significant ecological and cultural resources in the project area include the following:

- Scenic beauty of the river
- Native American cultural resources in the floodplain and adjacent Trimbelle River terrace and Prairie Island
- Prairie Island Indian Community
- Floodplain forest and emergent marsh wetlands in the Marsh and Gantenbein Lakes area, Cannon River Bottoms
- Migratory fish, including sturgeon, paddlefish
- Freshwater mussels in the lock and dam 3 tailwater

- Migratory birds that use the Marsh and Gantenbein Lakes area, including neotropical warblers, raptors, colonial-nesting herons and egrets, and waterfowl
- Bald eagles that nest near Lock and dam 3
- Tailwater sport fishery supported by walleye and sauger

The MDNR and WDNR recognize lake sturgeon, paddlefish, walleye, sauger, and several other fish species that occur at Lock and Dam 3 as significant resources.

The tailwater at Lock and Dam 3 supports a species-rich and abundant mussel bed that is not very infested by zebra mussels. A number of State-listed threatened and special concern mussel species occur in the tailwater near Lock and Dam 3. This mussel bed is considered a significant resource by the States and the USFWS.

The wetland resources near Lock and Dam 3 are of high quality. The extensive Gantenbein Lakes wetlands area along with the Cannon River Bottoms across the river provides an ecologically significant large contiguous floodplain habitat area close to the Twin Cities metropolitan area. The wetland resources and floodplain forest are recognized as significant resources by State and Federal regulations, landowners, State and Federal agencies, conservation organizations and the public.

Thousands of migrating neotropical songbirds and waterfowl fly through the study area. Large numbers of warblers occur in the floodplain near the lock and dam in May during their northward migration. Marsh and Gantenbein Lakes serve as a migration feeding and resting area for thousands of migrating waterfowl in the fall. These migrating birds are internationally-recognized significant resources.

Bald eagles occur in the study area and are a federally listed threatened species. Bald eagles nest close to the lock and dam.

The tailwater sport fishery at Lock and Dam 3 is a popular, year-round fishery that is recognized as significant by the States and the public. The Mississippi River Pool 4 sport fishery is worth more than $3 million per year to the local economy.

Significant cultural resources in the project area include the Prairie Island Indian Community, many Native American cultural resource sites in the area, and Lock and Dam 3.

Lock and Dam 3, the Mississippi River navigation channel, the Prairie Island Nuclear Power Plant and the Allen S. King Power Plant (on the St. Croix River) are significant infrastructure resources in the study area.

2.8 Planning Objectives

Study participants provided input on objectives for future conditions at Lock and Dam 3. In summary, the planning objectives for this reevaluation are as follows:

1. Improve navigation safety; reduce risk of navigation accidents.

2. Reduce risk of embankment failure.

3. Protect the river ecosystem.

Study participants identified the following, more detailed, list of objectives:

- Improve navigation safety; reduce risk of navigation accidents for both commercial and recreational navigation.
- Maintain navigation by allowing the operation and maintenance of the lock and dam in a safe and reliable manner.
- Reduce the potential for loss of life, damage to barges, barge spills into the river, and damage to the lock, gated dam and embankments caused by outdraft conditions.
- Protect the lock and gated dam from structural failure.
- Minimize future operations and maintenance costs.
- Strengthen the Wisconsin embankments; reduce the risk of embankment failure.
- Maintain Pool 3 at existing elevations and locations with an acceptable amount of risk of accidental drawdown.
- Minimize threats that would result in an accidental pool drawdown in spite of an emergency response.
- Minimize the potential effects if an embankments failure were to occur.
- Provide for a safe, accessible and timely way to inspect the completed project site.
- Protect and restore the river ecosystem.
- Avoid and minimize construction impacts.
- Mitigate for unavoidable losses of significant resources.
- Maintain the existing values and functions of Marsh and Gantenbein Lakes.
- Maintain or improve fish passage through Lock and Dam 3.
- Maintain existing opportunity for fish passage into Marsh and Gantenbein Lakes.
- Maintain or restore wetland habitat in Marsh and Gantenbein Lakes.
- Maintain the sport fishery and the diverse mussel beds near Lock and Dam 3.
- Minimize impacts on recreation.

2.9 Planning Assumptions

Planning assumptions underlie the logic of the planning process. Although these states of nature and anticipated human activities are not certain, they are assumed to apply in the future:

- The Upper Mississippi River Navigation Project will continue to be operated, maintained and used for the foreseeable future.

- Commercial and recreational navigation traffic through Lock and Dam 3 will continue at rates approximating those of recent years.

- The hydrologic regime of the Mississippi River will remain within historic seasonal ranges of flow.

- Factors affecting the stability of the Wisconsin embankments (such as head differential, overtopping, erosion, woody debris accumulations, animal burrowing, tree throw, and seepage) will continue to occur.

- The value of uses of Pool 3 (for example, navigation, recreation, and electrical power generation) will continue and increase.

2.10 Planning Constraints

Planning constraints are temporary or permanent limits imposed on the scope of the planning process and choice of solutions and include ecological, economic, engineering, legal, and administrative constraints. Some are states of nature; some are based on the design of built structures and other engineering considerations. Legislation and policy-making impose other constraints. The human-imposed constraints are possible to change. Following are the planning constraints identified in this study:

1. The planning process must be consistent with all applicable Federal, State, and local laws, regulations, and policy.

2. The Final Integrated General Reevaluation Report and EIS will be submitted to the Corps Mississippi Valley Division in January 2007.

3. Planning for this study will be limited to water and related land resources in the vicinity of Lock and Dam 3.

4. The existing population, land uses, communities, and economy of the Upper Mississippi River in the vicinity of Lock and Dam 3 impose constraints.

5. The existing design and condition of the built water resources projects in the vicinity of Lock and Dam 3, including the lock and dam and the Wisconsin embankments, impose constraints.

6. The existing design and operation capabilities of the commercial towing industry towboats and barges, as well as the capabilities of towboat pilots and crews, impose constraints.

7. The climate, hydrology, hydraulic conditions, geology, soils, and native biota of the Upper Mississippi River in the vicinity of Lock and Dam 3 impose constraints.

8. The St. Paul District's lack of authority and funding sources to construct ecosystem restoration features at Lock and Dam 3 imposes constraints.

This page intentionally left blank.

CHAPTER 3. PROBLEMS, NEEDS AND OPPORTUNITIES

3.1 Problems

Lock and Dam 3 was constructed on a bend in the Mississippi River with an experimental design for the Wisconsin embankments to avoid impounding high quality floodplain habitat of the Cannon River Bottoms and Gantenbein Lakes areas . The location of the lock and dam on a bend in the river and its unique embankments design have led to long-standing problems with navigation safety for down bound tows and with the lack of a continuous embankment that connects the gated part of the dam to high ground on the Wisconsin side of the river. These problems are related in that navigation accidents can result in erosive overtopping and failure of the Wisconsin embankments. Failure of the Wisconsin embankments could allow a scour channel to develop around Lock and Dam 3, leading to an accidental drawdown of navigation Pool 3.

3.2 Existing Conditions

3.2.1 Problem: Navigation Safety

Because the lock is on the outside of a bend in the river, an outdraft current sweeps across the upper lock approach from along the Minnesota bank toward the gated part of the dam, making navigation difficult for commercial tows. Many navigation accidents have occurred (Figure 3-1, Table 3-1). This outdraft current sweeps the head of the tow away from the lock chamber toward the gated part of the dam and makes alignment of the tows for entry into the lock chamber difficult, with longer tows affected more severely. Towboat pilots often have to make several attempts to align a tow and enter the lock. The outdraft current has the greatest effect on down bound tows in the lock approach, although up bound tows have been caught by the outdraft current resulting in navigation accidents.

The outdraft current occurs when river discharge exceeds about 21,000 cubic feet per second (cfs) (Figure 3-2). The outdraft current intensifies at higher flows. It occurs about 40 percent of the navigation season.

A total of 65 outdraft-related navigation accidents have occurred at Lock and Dam 3 from 1963 through 2005. On 11 occasions during the same period, outdraft-related navigation accidents have resulted in tows colliding with the gated part of the dam (shown in bold in Table 3-1).

The damage figures expressed in Table 3-1 are primarily the costs to repair Lock and Dam 3 and do not include salvage costs, damage to vessels or spill response costs. Damage and cost figures are included in the risk and benefit-cost analysis for this project (see Appendix E - Economics) and include cost of response to spills of product from barges and repairs to the dam, commercial vessels, and the Wisconsin embankments. They also include damages and costs resulting from an accidental drawdown of Pool 3 such as navigation delay costs, costs associated with the shutdown of two major power plants, and damages to local marinas.

Figure 3-1. August 1, 1993, navigation accident at Lock and Dam 3 with barge sunk in dam gate.

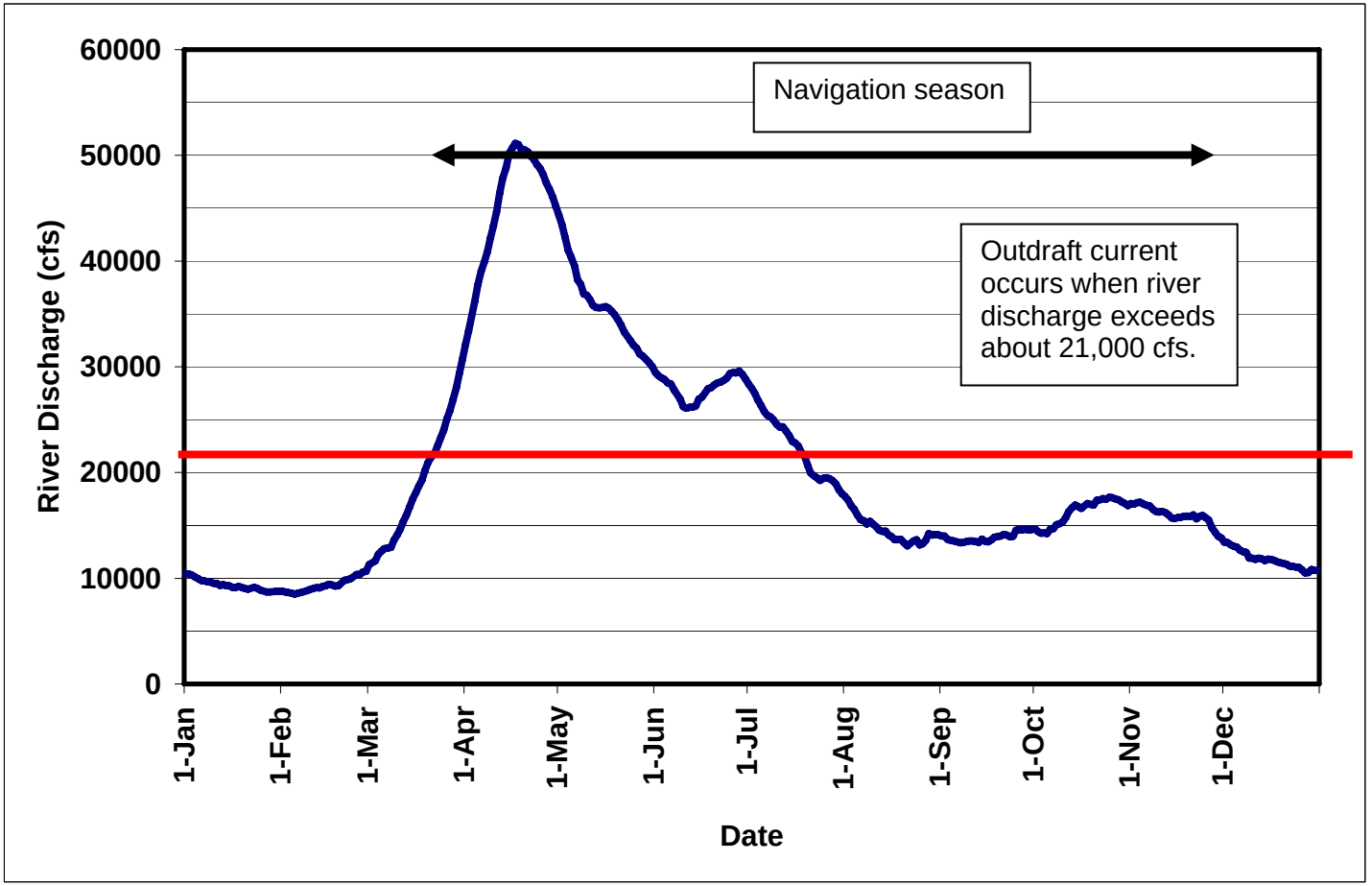


Figure 3-2. Average daily river discharge for the period January 1959 through December 2005 and occurrence of outdraft conditions during the navigation season.

Table 3-1. Record of navigation accidents at Lock and Dam 3, April 1963 through November 2005

DATE	TIME	M/V	COST ESTIMATE	REMARKS	RIVER Q (cfs)	NO. BARGES	ASSIST BOAT
3-Nov-2005	2:05	Coral Dawn	$52,402	Tow hit miter gate #2, damaged 6 timbers and damaged ste	21,400	9	None
29-Jul-2005	21:40	Crimson Glory	No Damage	Tow hit previously damaged timbers.	10,100	12	None
6-Jun-2005	12:05	Phillip M Pfeffer	$2,335	Tow surged backward damaged 2 timbers on miter gate #4.	32,800	9	None
30-Apr-2005	19:50	Prosperity	$1,180	Barges surged back into mitergate #2 breaking a timber.	32,700	9	None
13-Apr-2005	16:30	Joesph Pat Eckstein	No Damage	**BARGES IN DAM, 2 barges passed through dam**	44,800	9	None
6-Sep-2002	0:58	J. Andrew Eckstein	No Damage	No damage to structure, tow bumped wall and broke wires.	28,100	8	None
2-May-2002	18:45	Lil Charley/Kevin Michael	$4,280	M/V Kevin Michael pushed Lil Charley up bull nose.	35,300	7	Lil Charley
4-Oct-2001	13:00	L.J. Sullivan	$949	MG2 - One broken timber.	7,700	7	None
13-Sep-2001	13:00	Mary Lynn	$806	Tow surged back into miter gate #4	7,800	8	None
21-Jun-2001	0928	Jo Anne Stegbauer	$750	Tow damaged handrail miter gate #2	59,200	4	None
18-Sep-2000	12:00	Hamilton	$1,199	Misaligned during entry, damaged miter gate timber	6,000	3	None
10-May-2000	1:35	Evey T	$1,300	Backing line on head parted, drifted back, hit miter gate	13,100	9	None
27-Mar-2000	10:50	Seminole Princess	$19,100	Misaligned entering, hit timbers on miter gate	19,100	8	None
21-Aug-1999	20:30	KLJ Erickson	$23,600	Departing, hit miter gate	23,600	4	None
8-Nov-1997	12:15	William C. Norman	$2,500	Hit miter gate	15,000	6	None
13-Aug-1997	14:20	Bobby Jones	$1,200	Misalignment, hit miter gate	22,100	3	None
26-Jul-1997	15:30	Cooperative Vanguard	$1,742	Misalignment, hit miter gate	38,200	12	None
12-Nov-1996	9:20	Dell Butcher	$18,000	Struck loading dock during approach	22,300	15	Miss Sheila
10-Oct-1996	20:30	Philip M. Pfeffer	$1,250	Not properly backing boat, struck gate timbers	8,400	7	None
29-Apr-1996	22:50	Sheila Johnson	<$100	Misalignment, hit miter gate	7,700	15	None
15-Apr-1996	18:45	Marian Hagestad	$3,800	Struck loading dock during approach	54,200	2	None
13-May-1995	15:10	Kathleen Pater	$9,000	Misalignment, hit loading dock	110,800	2	Miss Sheila
18-Apr-1994	8:30	Frank H. Peavey	No Damage	Misalignment during approach, hit bullnose	38,700	12	Beverly Cummings
1-Aug-1993	14:02	Hornet	$348,000	**BARGES IN DAM, 1 barge sinking across gates**	47,100	12	Beverly Cummings
29-Apr-1993	2:30	Dominique You	$1,355	Excessive speed, misalignment	47,500	5	None
18-Mar-1992	8:39	Cecilia Carol	N/C	Tow struck mooring cell. Cell destroyed.	55,400	9	Miss Sheila
23-Aug-1991	0:09	Conti Nan	$6,800	Misalignment, lost control of stern	18,900	15	Beverly Cummings
16-Jun-1991	1:00	Coral Dawn	No Damage	Misalignment during approach, hit bullnose	47,100	12	None
19-Apr-1991	23:55	Miss Kathy	No Damage	**BARGES IN DAM, petroleum barges**	40,000	4	None
28-Oct-1990	21:20	Larry Tilly	$525	Misalignment, expecting outdraft	16,000	15	None
26-Jul-1990	20:36	Nicholas Duncan	$250	Misalignment	15,000	10	None
16-Sep-1987	5:40	Margaret D		Tow surged forward	6,100	15	None
1-May-1987	17:30	Bernard F	$900	Misalignment	16,800	15	None
26-Sep-1986	13:30	Lindholm	No Damage	Misalignment	78,600	1	None
17-Sep-1986	10:30	Jennie Dehmer	$1,300	Misalignment, excessive speed	31,900	3	None
18-Aug-1986	N/D	Margaret D	$150	N/D	30,200	N/D	None
28-Mar-1985	17:15	Bruce Brown	No Damage	Tow struck bullnose	58,500	11	Miss Sheila
2-May-1984	1:30	Moonlight	$14,619	**BARGES IN DAM, tow engine failure**	49,000	8	Miss Sheila
14-Apr-1984	17:00	Paul H. Lambert	No Damage	Misalignment, struck bullnose	65,100	7	N/D
6-Apr-1983	13:00	Peter Franchi	$41,500	Misaligned, struck mooring cell	41,000	10	N/D
5-Apr-1982	21:15	Hawkeye	$1,200	Misaligned, struck mooring cell	55,300	9	N/D
27-Jun-1981	18:15	Sam M. Fleming	$6,700	Misaligned, struck upper guidewall	14,300	8	N/D
19-Jun-1981	2:30	Evey T	$10,500	Misaligned, struck miter gate	34,900	15	N/D
8-Jun-1981	22:45	Sunflower	$800	Misaligned, struck miter gate	13,400	15	N/D
1-May-1981	9:45	Evening Star	$1,500	Misaligned, struck upper guidewall	29,800	8	N/D
21-Nov-1980	14:38	Jane Russell	$13,000	Tow surged backwards during departure	9,800	6	N/D
13-Oct-1980	23:38	Luke Gladders	$2,000	Misalignment, pilot and crew error	7,500	15	N/D
11-Sep-1980	23:20	J.W. Hershey	$2,800	Barge caught protection angle on second cut	12,700	12	N/D
27-Jul-1979	9:12	Evey T	$2,500	Tow surged back when gates opened	22,500	8	N/D
8-Jun-1979	17:00	Dominique You	$2,000	Misalignment, pilot error	27,900	6	N/D
24-Oct-1978	4:15	Joseph Hendricks	$880	Misalignment	11,000	15	N/D
16-Aug-1978	7:15	Susan B.	$880	First cut of double pulled out, surged into miter gate	13,700	15	N/D

Table 3-1 (continued). Record of navigation accidents at Lock and Dam 3, April 1963 through November 2005

DATE	TIME	M/V	COST ESTIMATE	REMARKS	RIVER Q (cfs)	NO. BARGES	ASSIST BOAT
17-Jul-1978	1:45	Northland	$0	**BARGES IN DAM, barge damaged**	40,700	6	N/D
7-Jul-1978	4:20	Luke Gladders	$570	Misalignment, struck upper guidewall	36,700	6	Beverly Cummings
12-May-1978	3:40	Alvin C. Johnson	$0	Struck handrail	26,500	3	N/D
28-Apr-1978	3:15	Lindholm	$450	Misalignment, struck bullnose	40,200	6	N/D
14-Oct-1977	23:10	Lindholm	$4,800	Misalignment, struck mooring cell	21,600	6	N/D
11-Jun-1977	5:20	Prairie State	$5,000	Misalignment, struck mooring cell	6,800	15	N/D
26-May-1977	2:30	Prairie State	$46	Head of tow rubbed gate during departure	7,600	15	N/D
23-Apr-1977	15:40	Sam M. Fleming	$460	Tow surged backward when gate opened	13,900	4	N/D
14-May-1976	0:00	Kathryn Eckstein	$700	First cut of double pulled out, surged into miter gate	10,300	8	N/D
4-Nov-1974	13:30	Floyd H. Blaske	$1,690	Misalignment, damaged miter gate	12,375	13	N/D
9-Aug-1974	14:55	Thomas W. Martin	$590	Struck gate during setover, damaged gate seal	14,069	5	N/D
28-Jun-1974	20:45	Utah	$430	Engine failed to reverse, struck miter gate	29,664	9	N/D
15-Jun-1974	7:40	Cayuga	N/D	**BARGES IN DAM, engine malfunction**	29,664	8	N/D
21-Apr-1974	15:40	L.W. Childress	$800	Not outdraft related	54,000	15	N/D
28-Oct-1973	N/D	Harriet M.	N/D	Tow rubbed lower mooring cell	28,720	4	Mendota
19-Oct-1973	17:30	Evening Star	N/D	Assist boat struck by tow, excessive speed	46,000	2	Mendota
17-Oct-1973	2:30	Dan C	N/D	Second attempt, hit contractor's equipment	48,209	6	N/D
17-Oct-1973	18:35	Chippewa	N/D	Tow hit mooring cell, lowered gates to lessen outdraft	48,209	9	Mendota
17-Oct-1973	8:35	George Weathers	N/D	Second attempt, hit mooring cell	48,209	9	N/D
16-Oct-1973	8:25	Patricia Ann	N/D	**BARGES IN DAM, gates lowered, barges retrieved**	36,000	8	Mendota
2-Sep-1973	21:00	Prairie State	$840	No comments		12	N/D
19-Aug-1973	1:30	Arrowhead	$350	Backing second cut from lock, protection caught	14,700	12	N/D
1-Nov-1972	21:20	Susan Lane	$481	Misalignment, lower guidewall	17,500	13	N/D
16-Aug-1972	16:30	Emma Bordner	$265	Misalignment, struck guidewall	32,448	17	N/D
4-Aug-1972	9:25	Arrowhead	$5,000	**BARGES IN DAM, crew injury, ruptured barge**	59,000	8	Stegbauer
8-May-1972	20:35	Wade Childress	$715	Misalignment, tow struck miter gate	55,400	15	N/D
17-Apr-1972	0:05	Harriet M.	$80,000	**BARGES IN DAM, snapped line, ruptured barge**	41,400	4	N/D
20-Nov-1971	22:40	James Faris	$100	Guidewall timbers damaged, excessive speed	32,256	7	N/D
9-Nov-1971	15:45	Delia Ann	$6,200	**BARGES IN DAM, gas, hit guidewall, misalignment**	40,700	6	N/D
14-May-1971	5:00	Lucille	$400	Misalignment, inexperience	24,820	N/D	N/D
6-Apr-1971	20:10	Bill Gee	$100	Miter gate timbers damaged, outdraft-related	52,000	4	N/D
16-Apr-1970	N/D	George T.Horton	$336	leaving lock corner barge hit gate	36,000	6	N/D
3-Sep-1969	N/D	Baxter Southern	$1,200	Excessive speed, misalignment	6,200	N/D	N/D
24-Oct-1968	1:20	N/D	N/D	Breeze cited as cause	69,000	4	N/D
23-Jun-1968	N/D	Reliance	$2,600	Misalignment	39,500	N/D	N/D
12-May-1968	11:40	N/D	N/D	Upper guidewall timbers damaged, 1 engine down	16,600	9	N/D
28-Apr-1968	1:05	George Weathers	$18,500	4th approach, misalignment, excessive speed, outdraft	29,350	7	N/D
17-Aug-1967	20:30	Grave Estes	$166	Miter gate timbers damaged, approach and speed error	6,500	4	N/D
29-Jun-1967	17:45	L.W. Childress	$140	Outdraft and pilot error cited	52,500	15	N/D
12-May-1967	8:25	N/D	N/D	Poor approach, wires broken	25,000	6	N/D
11-May-1967	7:15	N/D	N/D	Underpowered tow, poor approach, barge damaged	26,000	6	N/D
5-May-1966	13:55	Peace	$18,000	Misalignment, gage house damaged, excessive speed	48,000	6	N/D
28-Apr-1966	13:20	Quachita	$4,225	Misalignment, wind, outdraft, tow damaged, underpower	50,000	6	N/D
22-Apr-1966	8:00	Cayuga	$330	Misalignment, guidewall timbers damaged	47,500	5	N/D
7-Apr-1966	17:40	Siouxland	$800	Misalignment, barge damaged, outdraft cited	60,000	4	N/D
14-Nov-1965	15:10	N/D	N/D	Misalignment	15,410	11	N/D
31-Aug-1965	7:10	N/D	N/D	Inadequate control in lock	11,918	5	N/D
22-Jul-1965	17:55	N/D	N/D	Miter gate timbers damaged, crew and pilot error	19,314	8	N/D
13-Sep-1964	17:05	N/D	N/D	Outdraft cited	21,802	8	N/D
21-Apr-1964	18:45	N/D	N/D	Miter gate timbers damaged, outdraft, excessive speed	29,000	N/D	N/D
8-Jun-1963	0:05	N/D	N/D	**BARGES IN DAM barge sunk, scour, outdraft cited**	29,000	6	N/D
28-May-1963	21:40	N/D	N/D	Miter gate timbers damaged, outdraft cited	21,840	8	N/D
25-May-1963	22:45	N/D	N/D	Miter gate timbers damaged, outdraft, underpower	22,545	11	N/D
16-Jun-1962	N/D	N/D	$0	Outdraft cited, no damage	31,750	6	N/D
4-May-1962	4:00	N/D	N/D	Protruding hatch cover	34,000	6	N/D
24-Apr-1962	12:50	N/D	N/D	Barges surged ahead in lock	46,750	3	N/D

A privately-owned and -operated helper boat is voluntarily used by most down bound pilots during outdraft conditions to counter the outdraft current and help align the tows to enter the lock (Figure 3-3). Although use of the helper boat reduces the potential for navigation accidents, accidents continue to occur. Although no fatalities to towboat crews or lock operators have been associated with outdraft-related navigation accidents, many close calls and some injuries have occurred. In addition to risk of injury and fatalities, navigation accidents can result in damage to the lock and dam, damage to towboats and barges, spills of hazardous and other cargo, and costly navigation delays.

Figure 3-3. Helper boat MV Little Charlie assisting a down bound tow to align with the upper guide wall at Lock and Dam 3.

Towboat pilots consider that the outdraft current at Lock and Dam 3 becomes difficult to navigate when river discharge exceeds about 21,000 cfs. Accident records indicate that the most accidents have occurred in the 15,000 cfs to 60,000 cfs range of river discharge (Figure 3-4).

Lock and Dam 3 is one of the most heavily used locks in the country for recreational boating. As many as 20,000 recreational boats typically lock through in a year. Any navigation safety improvement for commercial vessels must also maintain navigation safety for recreational boaters.

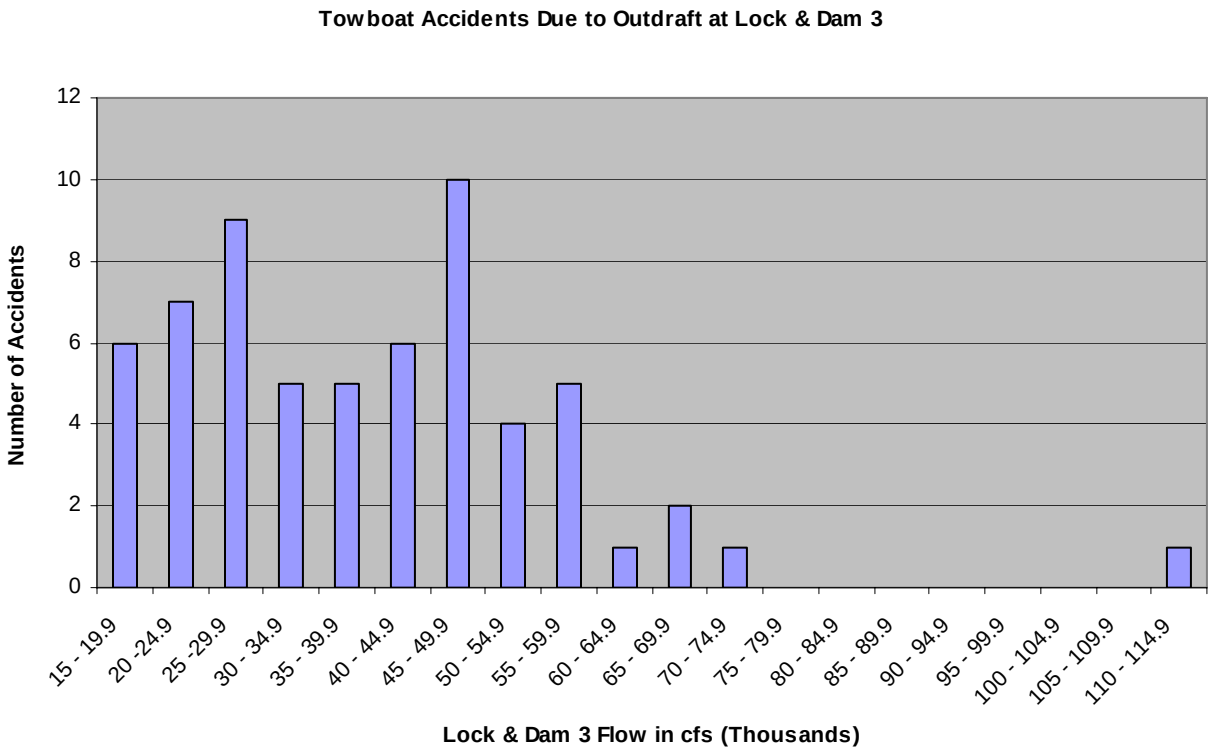


Figure 3-4. Outdraft-related navigation accidents at Lock and Dam 3 by level of river discharge.

3.2.2 Problem: Wisconsin Embankments

The Wisconsin floodplain area at Lock and Dam 3 has lakes, meander scrolls and natural river levees remaining from channel meandering before construction of the lock and dam. The floodplain area on the Wisconsin side of Lock and Dam 3 includes two shallow lakes: Gantenbein Lake and Marsh Lake. Most of the area is owned by the Diamond Bluff Associates, a private hunting club. In the 1930s, private landowners built low level dikes partially around the two lakes and controlled lake levels with a series of gated culverts.

Lock and Dam 3 is connected to high ground on the Wisconsin side by a segment of higher embankment near the dam constructed in 1999, older low constructed embankments, natural river levee ground, and a series of sheet-pile and rock overflow weirs called spot dikes (Figure 3-5).

Figure 3-5. Lock and Dam 3 and Wisconsin embankment alignments.

To stabilize the riverbank and maintain water levels in Pool 3, 10 sheet pile overflow weirs called spot dikes A through J were constructed as part of the original project in 1937. At higher levels of river discharge, water flows from Pool 3 over the Corps spot dikes into the lakes and then flows back into the Mississippi River downstream of the dam, effectively making the spot dike system the overflow spillway. Most of the overflow area has no erosion control protection except for natural vegetation.

The Corps spot dikes and adjacent natural banks and the downstream privately-owned dikes have changed from their original condition as a result of frontal erosion, caused in part by wave and ice action. In addition to the frontal erosion, overtopping erosion has caused washouts and eroded channels to form between some of the spot dikes in the upper embankment, and especially in the intermediate and lower dike alignments. If the erosion is not controlled, flow through Marsh and Gantenbein Lakes could produce a new channel that could bypass the dam.

The three Wisconsin embankments (upper, intermediate, and lower) act in combination to impound Pool 3 and two floodplain lakes (Marsh and Gantenbein Lakes) (Figures 3-5 and 3-6).

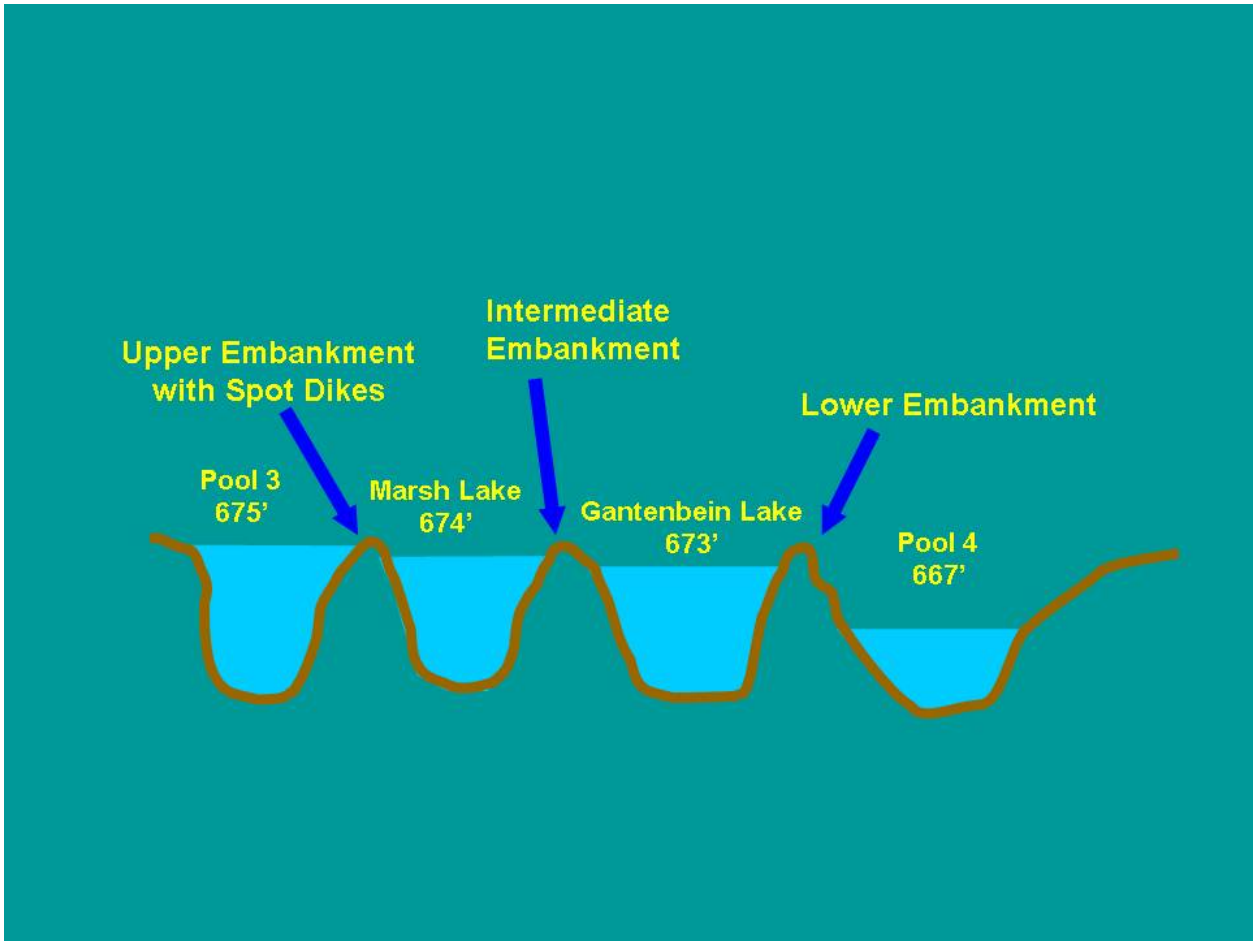


Figure 3-6. Diagram of the Wisconsin embankments at Lock and Dam 3 (not to scale).

At low levels of river discharge, the maximum head at Lock and Dam 3 (difference between Pool 3 and the tailwater) is 8 feet. During low to moderate levels of river discharge, the Wisconsin embankments do not overflow. At higher levels of river discharge exceeding 36,000 cfs, the tailwater rises to the level of Pool 3, the gates at Lock and Dam 3 are all raised out of the water, and the head across Lock and Dam 3 becomes less than 0.5 foot. During periods of higher river discharge, the Wisconsin embankments are inundated, and considerable flow passes through the floodplain on the Wisconsin side of Lock and Dam 3. During higher levels of river discharge when the embankments are overflowing, the head between Pool 3 and the tailwater is approximately 0.5 feet.

The upper embankment is owned by the Corps of Engineers and was constructed with a series of sheet pile weirs reinforced with rock (spot dikes A through J) across scour channels in the floodplain (Figure 3-5). A portion of the upper embankment near Lock and Dam 3 was raised in 1999 (spot dike A). Normally, a 1-foot head difference exists between Pool 3 and Marsh Lake across the upper embankment. A box culvert through spot dike D served as an inlet water control structure for Marsh Lake. The box culvert and its outlet channel are plugged and do not function as intended.

The intermediate embankment is a low, filled trail on privately-owned land that separates Marsh and Gantenbein Lakes. A culvert under the trail passes flow between the lakes. Normally, about 1 foot of head difference exists between the two lakes (Figure 3-6).

The lower embankment consists of natural river levee low ground, rock placed during emergency repairs, and old privately-constructed embankment segments. The lower embankment is on private land. An old gated culvert is an outlet water control structure for Marsh Lake.

The constructed parts of the embankment system were not built to modern standards of engineering design and have been deteriorating since the dam was completed in 1938 despite a series of repairs (Table 3-2, Figures 3-7, 3-8, and 3-9).

As the embankments deteriorated over time, the need for emergency repairs has increased. In the 1990s, erosion of the embankments reached a critical point where the land mass that once separated Marsh and Gantenbein Lakes from the river eroded away and breaches readily formed in the remaining narrow land mass. Some parts of the lower embankment are now only a few feet wide, and other parts consist only of rock that was placed during emergency repairs.

Table 3-2. History of repairs to the Wisconsin embankments at Lock and Dam 3, 1964 to present

Year	Repair Costs	Repair Description
2005	$52,000	Rock repairs 1,450 tons immediately downstream of the dam along lower embankment
2003	$25,000 [1]	Repairs to “end-flanking” at spot dike A by Corps, 110 tons of rockfill
1999	$20,000 [1]	Repairs to “sink hole” in spot dike A by Corps
1997	$50,000 -$70,000 [1]	Repairs to lower embankment by Corps
1995	$45,115	Repairs to spot dike A by contractor
1993	$144,000 [2][3]	Repairs to spot dikes and lower embankment
1984	$332,600 [2]	Restore upper embankment riprap shoreline
1983	$36,070 [2]	Replace rock on spot dike D.
1964	$18,563 [2]	Add 200-ton rock stockpile protection dike.

[1]Estimated cost.
[2]Repair cost from the Major Rehabilitation Evaluation Report, Lock and Dam 3 Embankments, Mississippi River, June 1995.
[3]Only the 1993 repairs were in response to a tow accident, the other years were band-aid repairs to the embankments.

Figure 3-7. Deteriorating spot dike in upper embankment at Lock and Dam 3.

Figure 3-8. Deteriorating lower embankment at Lock and Dam 3, one site of emergency repairs.

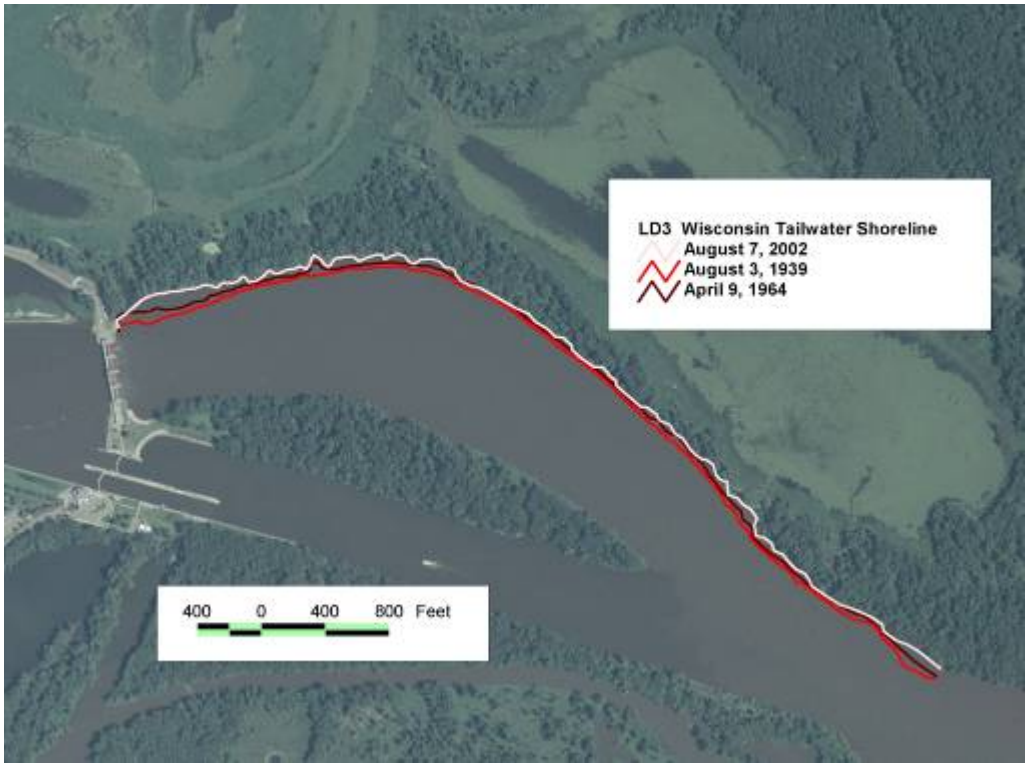


Figure 3-9. Erosion along Lock and Dam 3 lower embankment alignment 1939 to 2002.

Many erosion mechanisms (erosion during overtopping, tree throw, erosion by flow concentrated by woody debris, seepage, river currents, wake waves, ice, animal burrowing) threaten the Wisconsin embankment system. The upper embankment has been deteriorating as a result of loss of rock riprap adjacent to the old sheet pile at the spot dikes (Figure 3-7) and by new erosion channels. The lower and intermediate embankments were severely scoured during an August 1993 navigation accident (Figures 3-8 and 3-9). The lower embankment has been steadily eroded by river current and vessel wake waves in the tailwater area that is heavily used by recreational boats (Figure 3-9).

A commercial navigation accident can result in conditions that threaten the embankment system. If one or more of the movable gates at Lock and Dam 3 are made inoperable by a navigation accident, the level of Pool 3 can rise and overtop the natural riverbank and the embankments system when a head exists at the dam. The overflowing water can rapidly erode the weak soils in the floodplain. This occurred during a navigation accident in August 1993 (Figures 3-4 and 3-10). Emergency repairs in 1993 temporarily stabilized the riverbank. Failure of the embankments can rapidly lead to a scour channel around Lock and Dam 3, resulting in an accidental drawdown of Pool 3 with severe economic and environmental consequences.

Figure 3-10. Lock and Dam 3 lower embankment overtopped during a navigation accident in August 1993.

3.2.3 Existing Conditions - River Ecosystem

The river ecosystem in the vicinity of Lock and Dam 3 has been significantly altered from its former condition through the effects of impoundment, river regulation, habitat loss, sedimentation, overexploitation of fish and mussels, and degraded water quality (WEST 2000, Corps of Engineers 2000b). A description of the existing condition of the river ecosystem in the vicinity of Lock and Dam 3 is provided in Chapter 4, Affected Environment, of this report.

3.3 Future Without-Project Conditions

A forecast of future without-project conditions is used as a baseline to evaluate alternative plans. The without-project conditions are the conditions that would be most likely to occur in the future in the absence of any project to improve the navigation safety or the embankments at Lock and Dam 3 by the Corps of Engineers or any change in public law or policy. The without-project conditions include practices likely to be adopted by the public sector under existing law and policy as well as actions that are part of broader public and private initiatives for management of the Upper Mississippi River. From a Federal perspective, the without-project condition includes all actions that are currently authorized and foreseeable under existing programs for management of navigation and the river ecosystem. From a non-Federal perspective, the without-project condition includes any potential navigation industry actions that may be taken to improve navigation safety and to protect the river environment.

3.3.1 Future Without-Project Operation and Maintenance of the Navigation System

The Upper Mississippi River 9-Foot Channel Navigation Project will continue to be operated and maintained for the foreseeable future. River regulation, channel maintenance dredging, maintenance of channel training structures, maintenance of the lock and dam, and maintenance of aids to navigation (lights, buoys, and daymarks) are expected to continue.

3.3.2 Future Without-Project Navigation Traffic

For the 37-year period from 1965-2002, navigation traffic on the Upper Mississippi River has increased by an average annual growth rate of 2.2 percent (Corps of Engineers 2004). Most commercial traffic on the Upper Mississippi River is in the lower part of the system. The annual number of down bound tows passing through Lock and Dam 3 has varied between about 400 and 700 in recent years (Figure 3-11). Future down bound commercial traffic rates through Lock and Dam 3 have been forecasted based on mid-value demand elasticity and mid-value traffic forecast (Corps of Engineers 2004) (Table 3-3).

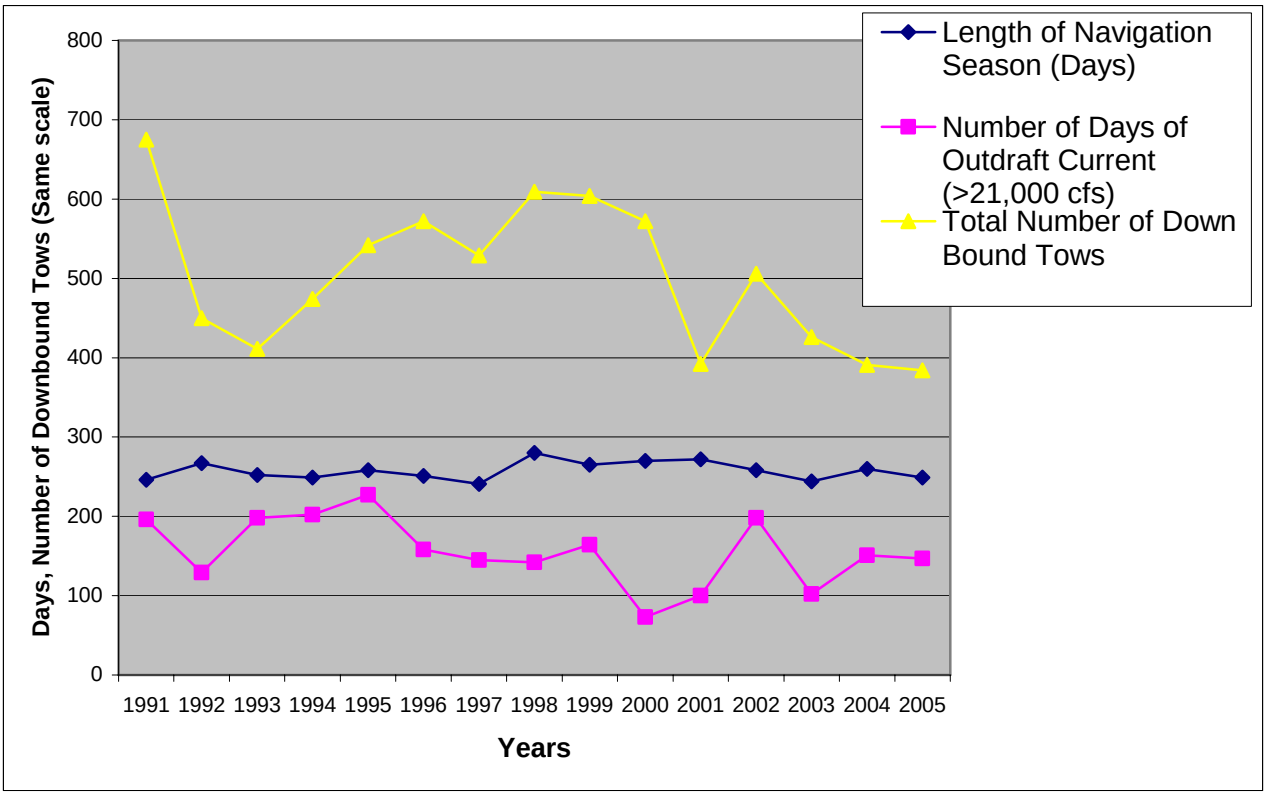


Figure 3-11. Number of down bound tows passing through Lock and Dam 3, number of days of outdraft current, and length of the navigation season from 1991 through 2005.

Table 3-3. Future forecast of down bound tows through Lock and Dam 3, from the Upper Mississippi River – Illinois Waterway Navigation Feasibility Study.

Year	Number of Down Bound Tows
2010	591
2015	603
2020	621
2025	633
2030	638
2035	622
2040	618
2050	585

In addition to demand for shipping, the number of days in the navigation season affects the number of tows that pass through Lock and Dam 3 each year. The river is opened to traffic in March and closed in late November as ice conditions allow. The number of days in the navigation season at Lock and Dam 3 has varied between 241 and 280 days in recent years (Figure 3-11).

The number of tows with hazardous cargoes passing down bound through Lock and Dam 3 has varied between 0 and 121 per year, with an average of 59 tows per year over the 1985 through 2005 period (Table 3-4 and Figure 3-14). Hazardous cargoes passing through Lock and Dam 3 are mostly petroleum products. According to the Upper Mississippi River Waterway Association, the frequency of tows with hazardous cargo passing down bound through Lock and Dam 3 is not expected to change in the foreseeable future.

Lock and Dam 3 is one of the most popular locks for recreational boating in the country. As many as 20,000 recreational boats pass through Lock 3 in a year. Recreational boating traffic on the Upper Mississippi River has been increasing. Boating traffic on Pools 3 and 4 is expected to increase in the future, keeping pace with the population of the Twin Cities Metropolitan Area (Carlson et al. 2000).

Table 3-4. Summary and analysis of Lock and Dam 3 navigation data reported for the 1985 through 2005 period. Parameter values are from the Lock Performance Monitoring System. "Outdraft tow" means tows passing through Lock and Dam 3 during outdraft conditions, when river discharge is greater than 21,000 cfs. "Hazardous tows" means tows carrying hazardous materials as cargo.

Parameter	Mean	Standard Deviation	Minimum	Maximum
Number of down bound tows/year	568	98	384	800
Number of outdraft tows/year	284	150	63	655
Frequency of outdraft tows	0.50	0.27	0.09	0.98
Outdraft incidents/year	1.00	0.97	0	3.00
Probability of outdraft tow incident	0.0035	0.0026	0	0.0076
Number of non-outdraft tows/year	284	199	15	653
Frequency of non-outdraft tows	0.50	0.27	0.02	0.91
Non-outdraft incidents/year	0.75	1.18	0	4.00
Probability of non-outdraft incidents	0.0026	0.0031	0	0.0094
Number of hazardous tows/year	59	34	0	121
Frequency of hazardous tows	0.10	0.06	0	0.22

3.3.3 Future Without-Project Outdraft Conditions

The geometry of the river in the upper approach to Lock and Dam 3 is not expected to change significantly in the future, and the outdraft current would continue to occur without a project to modify it. Outdraft conditions are expected to continue to occur about the same percent of time during the navigation season as in recent years (Figure 3-11).

3.3.4 Future Without-Project Helper Boat Use

A privately-owned helper boat is voluntarily used by most down bound pilots during outdraft conditions to counter the outdraft current and help align the tows to enter the lock. Towing companies voluntarily make use of the helper boat and pay for each use. Use of the helper boat indicates that the risk of an outdraft-related accident is deemed unacceptably high at Lock and Dam 3 to most of towboat operators. Helper boat use by down bound tows during outdraft conditions (river discharge greater than 21,000 cfs) has varied between 19.4 and 76.9 percent in recent years, averaging 53.3 percent (Figure 3-12). Of the 65 outdraft-related navigation accidents that have occurred during the period from 1963 through 2005, 14 have occurred when the helper boat was being used (Table 3-1, Figure 3-13).

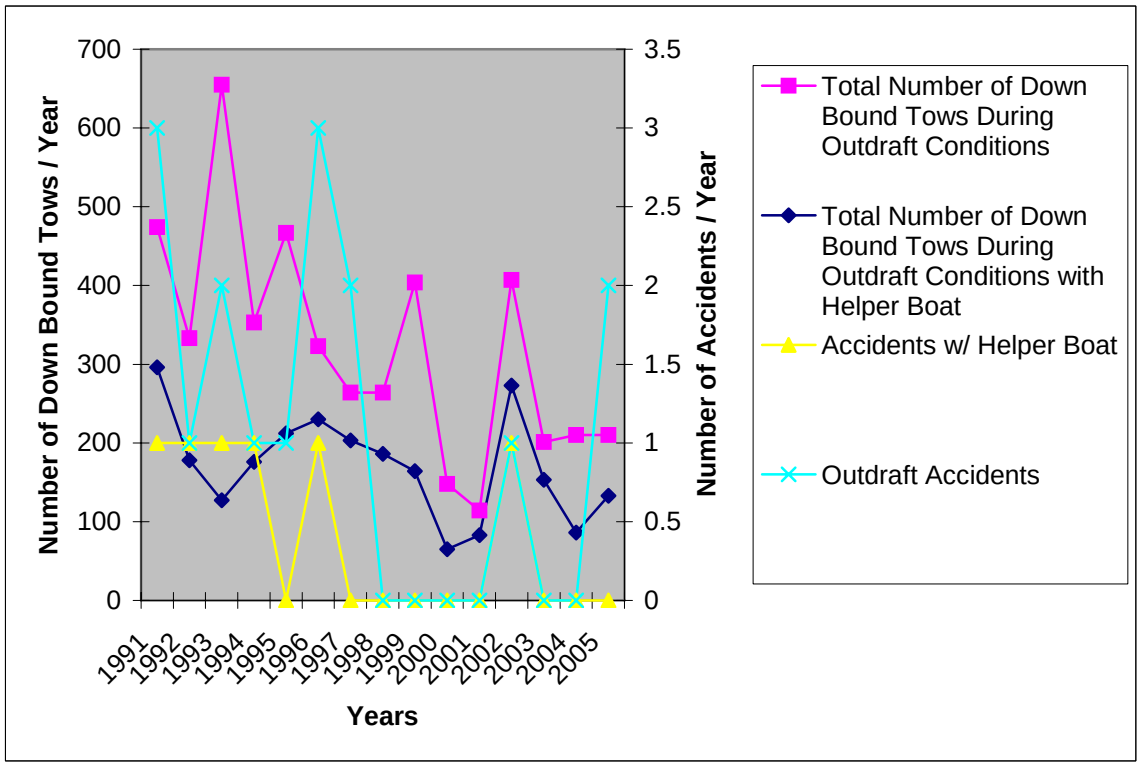


Figure 3-12. Helper boat use by down bound tows at Lock and Dam 3 during outdraft conditions from 1991 through 2005.

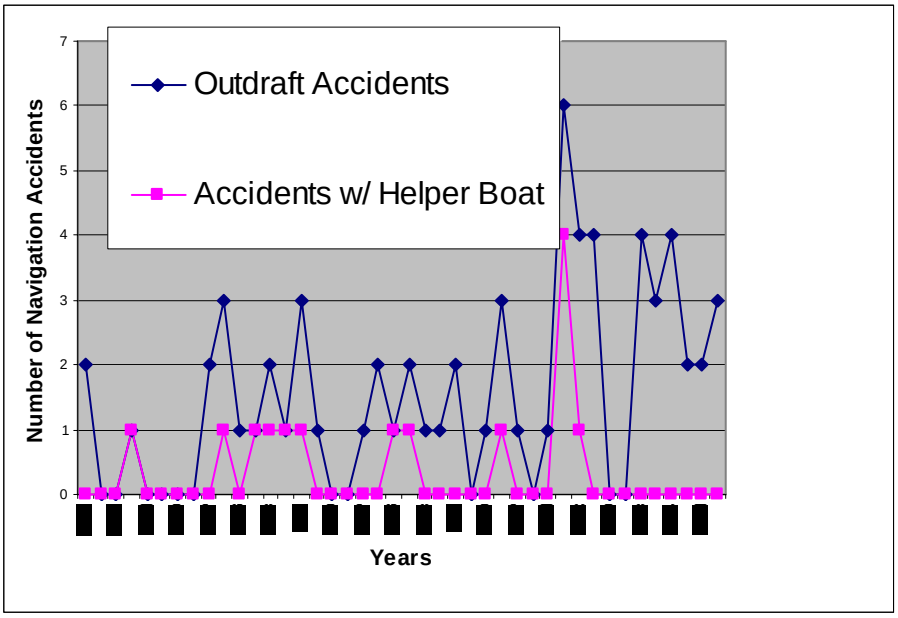


Figure 3-13. Outdraft-related navigation accidents at Lock and Dam 3 and outdraft-related accidents that occurred when a helper boat was being used during the years 1963 through 2005.

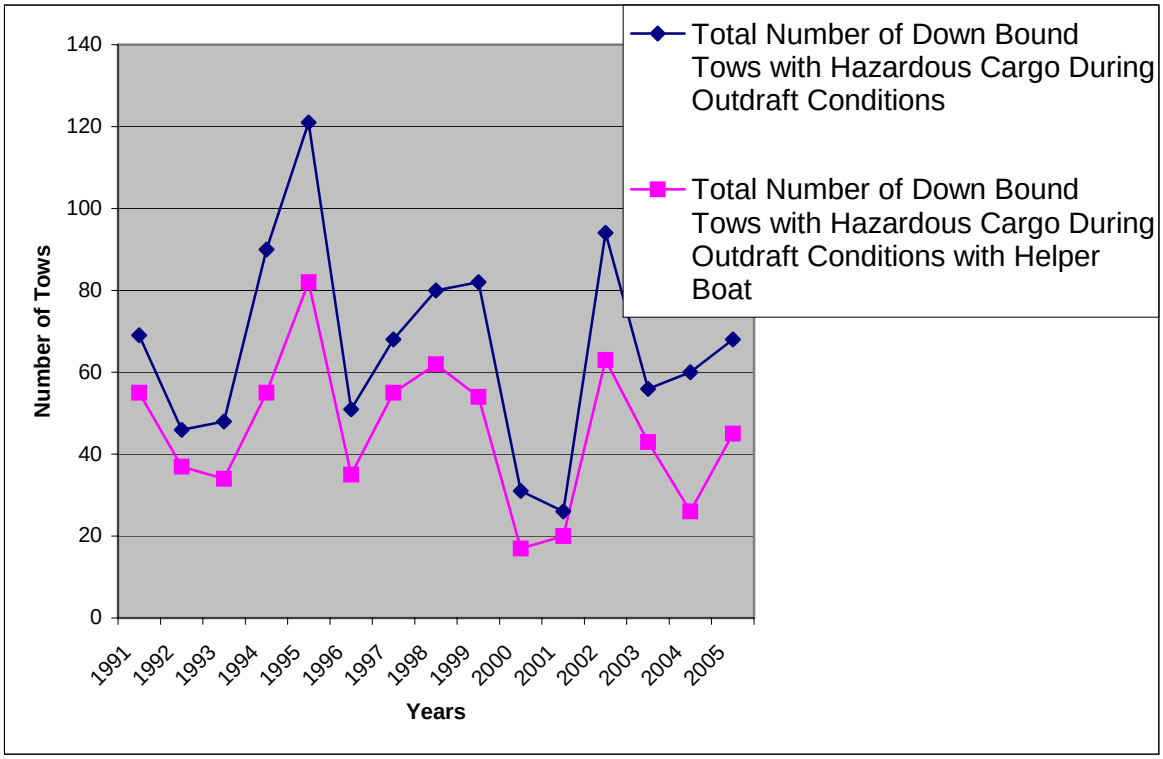


Figure 3-14. Helper boat use by down bound tows with hazardous cargoes at Lock and Dam 3 during outdraft conditions from 1991 through 2005.

Down bound towboat pilots with hazardous cargoes make greater use of the helper boat at Lock and Dam 3 during outdraft conditions, between 54.8 percent and 80.4 percent, averaging 70.8 percent (Figure 3-14).

The company that owns and operates the helper boat has indicated that it intends to continue to provide the service during outdraft conditions. The towing industry has indicated that it intends to continue to make use of the assist boat. The cost of the helper boat use is about $500 per "push." The towing industry will continue to pay this cost. This cost will probably rise with the cost of fuel in the future.

3.3.5 Future Without-Project Navigation Safety Industry Initiatives

The towing industry voluntarily makes up smaller down bound tows leaving the Twin Cities when outdraft conditions occur at Lock and Dam 3. The smaller tows are more maneuverable and less prone to being swept toward the gated part of the dam by the outdraft current. This safety initiative is partially offset by the increased number of down bound tows that result.

In March 2006, the USCG, RIAC, and Corps of Engineers completed an Upper Mississippi River Annex to the Upper Mississippi River and Tributaries Waterways Action Plan. The Annex is available to read on-line from the USCG Mississippi River Sector web site at: http://www.uscg.mil/d8/sector/umr/wap.html

The annex provides general information and target gauges to be used as a guideline for a crisis on the Upper Mississippi River between river miles 109.9 to 857.6. In the face of such a crisis, it is the responsibility of the USCG, Corps of Engineers, and river industry representatives to meet and discuss conditions on the river and to annually review the actions specified in the plan, typically the first week of November. Section 4 of the annex divides the entire Upper Mississippi River into 28 zones. Each zone is delineated by river mile and is characterized by river stage with three action phases (e.g., Watch, Action, and Recovery Phases) described in the plan. A combination of reference gauges, historical data and known impact areas was used to define these zones. The plan supports the U.S. Department of Transportation in its role in emergency support function (ESF) #1 of the National Response Plan to coordinate the Emergency Management of the Transportation System (EMTS) in the prevention/mitigation, preparedness, recovery, infrastructure restoration, safety, and security of the Nation and its transportation system. It is intended to report damage to the transportation infrastructure as a result of an incident, coordinate alternate transportation services, coordinate the restoration and recovery of the transportation infrastructure, and coordinate and support prevention, preparedness, and mitigation among transportation stakeholders at the State and local levels.

Towboat pilots are highly trained, experienced, and are licensed by the USCG. Towboat pilots communicate frequently with other pilots and lockmasters and are acutely aware of river conditions affecting navigation safety including the outdraft current at Lock and Dam 3.

The industry navigation safety practices presently being implemented to reduce the risk of navigation accidents are likely to continue. No new practices have been identified that would further reduce the risk of outdraft-related navigation accidents at Lock and Dam 3.

3.3.6 Future Without-Project Navigation Accidents

A total of 65 outdraft-related navigation accidents have occurred from 1963 through 2005. That number may be low, because many of the earlier records indicate that it was not determined if the outdraft condition contributed to the cause of the accident. Of these 65 outdraft-related navigation accidents, 11 resulted in tows colliding with the gated part of the dam.

In the absence of a project to improve navigation safety at Lock and Dam 3, outdraft-related navigation accidents are expected to occur at approximately the same rates as in recent years. Contributing factors to navigation accidents include the factors described above and illustrated in Figure 3-15.

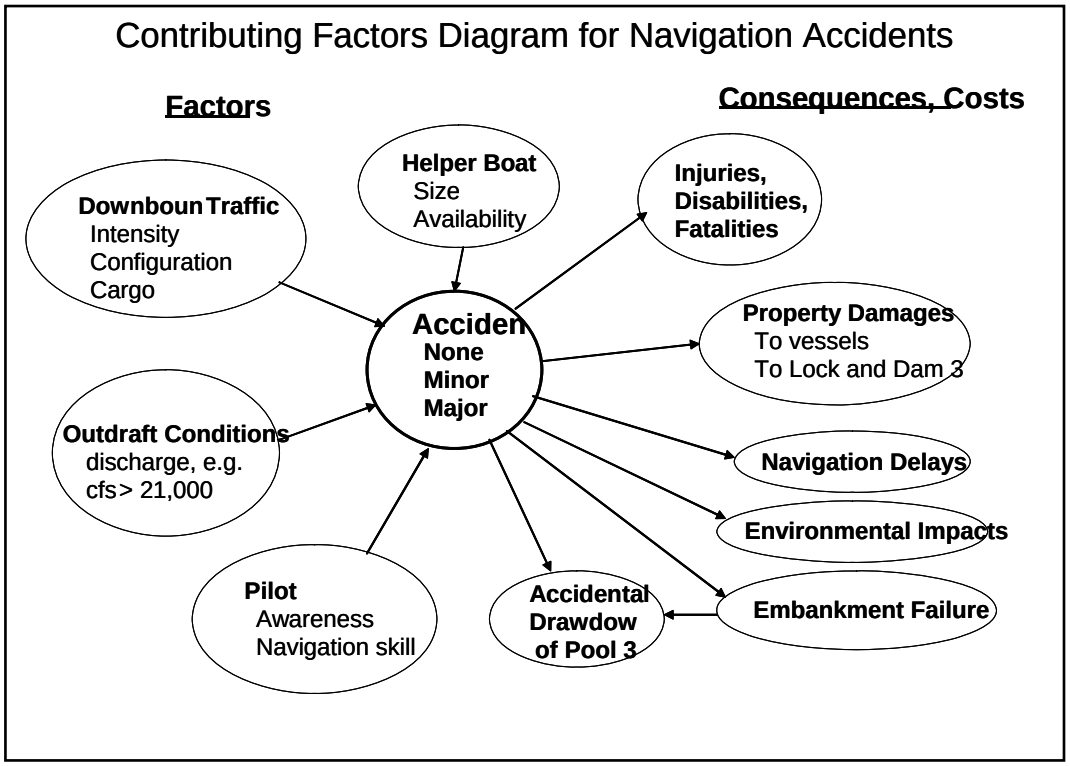


Figure 3-15. Factors contributing to commercial navigation accidents at Lock and Dam 3.

The consequences of navigation accidents include injury and loss of life, property damage to vessels and the lock and dam, cargo spills, environmental damage from spills of hazardous materials, costs of salvage operations, navigation delays, and spill response. Costs of these accidents will continue to accrue in the future without-project condition as they have in the past, although such costs can vary widely between accidents. Navigation accidents can lead to loss of water control at the dam, overtopping and failure of the Wisconsin embankments, and accidental drawdown of Pool 3. An accidental drawdown of Pool 3 would close navigation, force shut-down of two large electrical generating plants, damage docks at marinas, damage wetland habitat in the Gantenbein Lakes area, and dewater up to 2,500 acres of shallow aquatic habitat (see section 3.3.7 below).

3.3.7 Future Without-Project Conditions – Embankments

The erosion mechanisms affecting the Wisconsin embankments at Lock and Dam 3 will continue to operate in the future (Figure 3-16). Failure of the Wisconsin embankment system and an accidental drawdown of Pool 3 are likely to occur over the next 50-year planning period. Portions of the lower embankment consist only of rockfill placed during emergency repairs. Also, parts of the lower embankment between Gantenbein Lake and the Mississippi River are only a few feet wide. If a breach in the lower embankment were to occur when a head exists at the dam, a scour channel could rapidly enlarge upstream through the weak sediments in the Gantenbein Lakes area (Figures 3-17 and 3-18). Without a project to strengthen the embankments, continued patchwork repairs would need to be done with increasingly ineffective results.

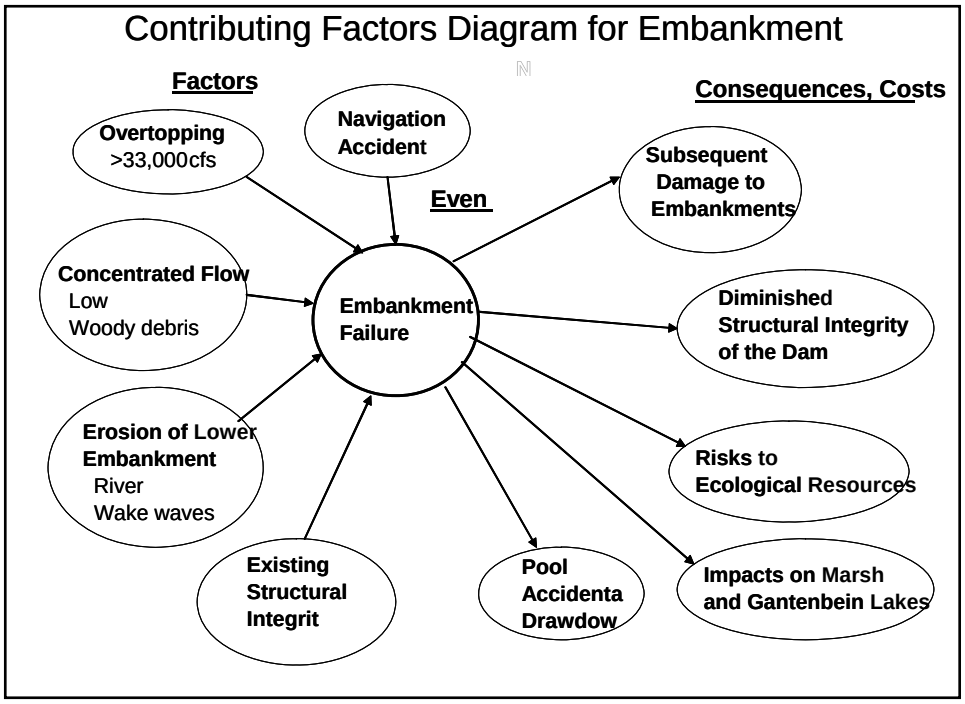


Figure 3-16. Factors contributing to embankments failure at Lock and Dam 3.

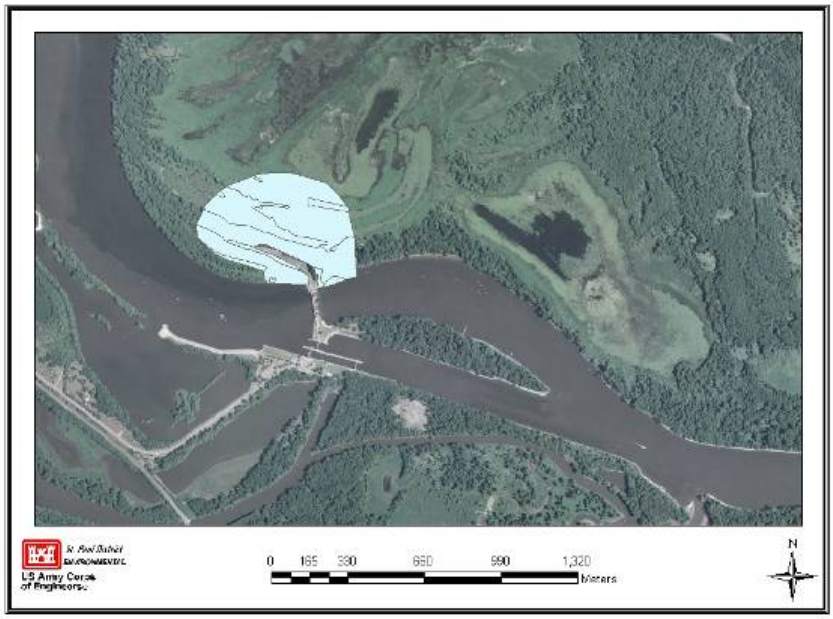


Figure 3-17. Potential area scoured by an embankment failure around Lock and Dam 3.

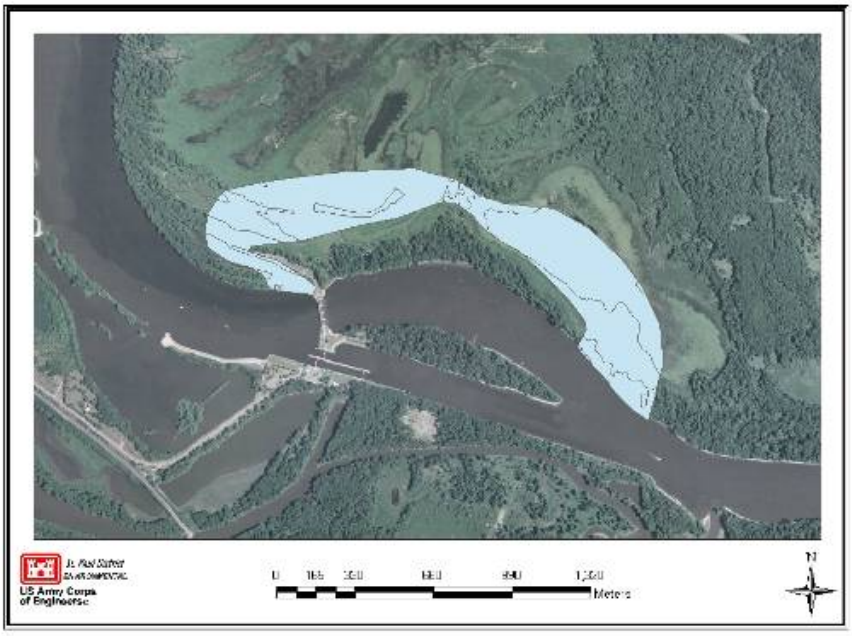


Figure 3-18. Another potential area scoured by an embankment failure around Lock and Dam 3.

The consequences of embankments failure (Figure 3-16) include damage to the embankments and Lock and Dam 3, environmental damage from erosion and dewatering of the Gantenbein Lakes area, and the costly economic and environmental consequences of an accidental drawdown of Pool 3. Without-project costs of embankment repairs are expected to increase over historic costs (Table 3-2) as the embankments continue to deteriorate.

Breaches can occur at many locations along the embankment system. The rate of scour channel formation and its geometry would depend on head at the dam, river discharge, and locations of breaches.

A breach through the Wisconsin embankments could result in a rapid accidental drawdown of Pool 3 of 2 to 6 feet, depending on the size of the breach. An accidental drawdown would force closure of the navigation channel until normal water levels were restored. The expected length of the closure would be approximately 5 weeks. The average daily cost to the commercial navigation industry over a 5-week closure is estimated to be $984,000. Recreational boating would also be affected. Access to Pool 3 would be limited, and docks at marinas in Pool 3 could be damaged. Access to the Prairie Island Indian Community marina would be blocked, and their tour boats would be unable to operate.

Embankment failure can result in erosion damage to up to about 200 acres of floodplain and aquatic habitat near the breach sites (Figures 3-17 and 3-18). Accidental dewatering and scour would damage the high quality wetland habitats in Marsh and Gantenbein Lakes.

An accidental 5-foot drawdown of Pool 3 would rapidly dewater approximately 2,500 acres of shallow aquatic habitat, stranding fish and mussels and killing submersed aquatic vegetation (Figure 3-19). Emergency repairs would also further disturb the wetland habitat.

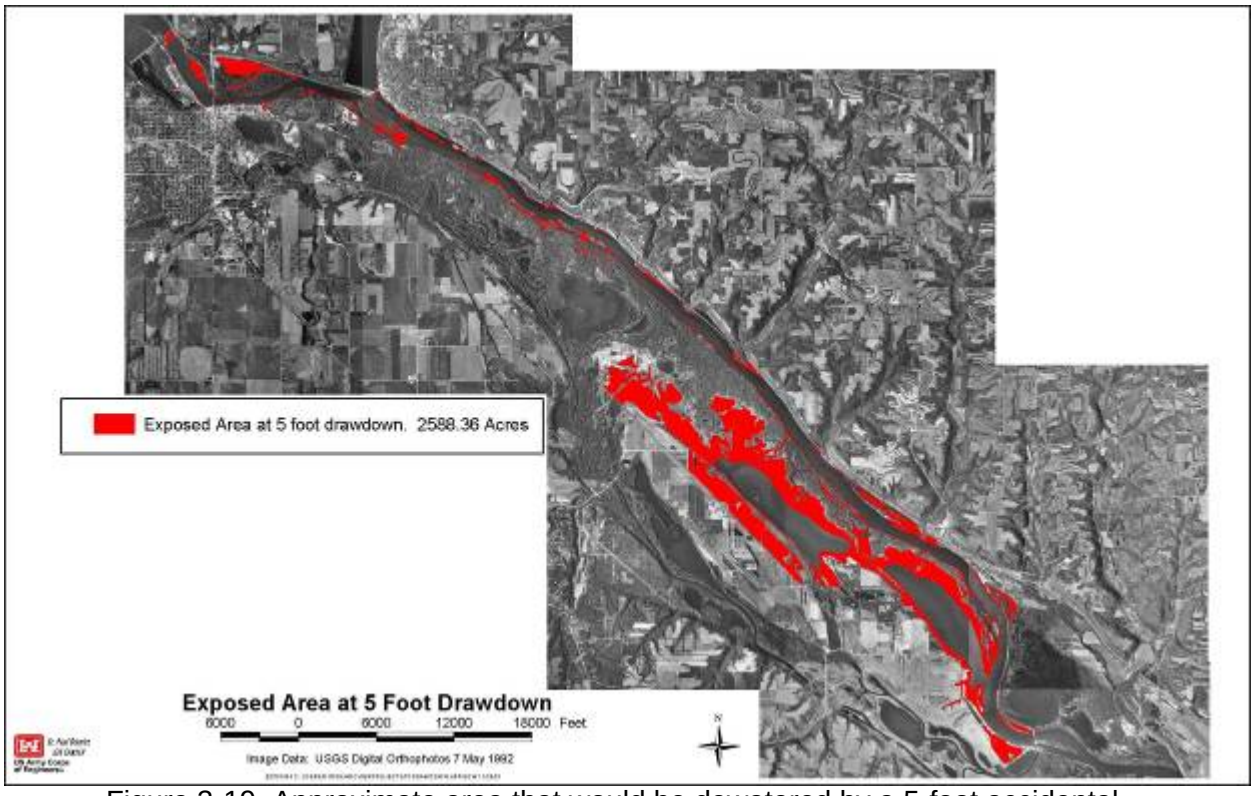


Figure 3-19. Approximate area that would be dewatered by a 5-foot accidental drawdown of Pool 3. The intake of the Prairie Island Nuclear Generating Plant is just upstream of Lock and Dam 3 on the left descending bank. The Allen S. King Generating Plant is off this photo to the north on the St. Croix River.

In addition to a navigation closure while repairing the embankments and restoring Pool 3 water levels, an accidental pool drawdown would affect two electrical power generating plants. The Prairie Island Nuclear Generating Plant is on the Mississippi River immediately upstream of Lock and Dam 3. The Allen S. King Generating Plant is farther upstream in Pool 3, on the St. Croix River near Bayport, Minnesota. Both power plants use river water for cooling and require a minimum depth of water over their intakes to operate. In addition to the invert elevation of the intakes, the needed cooling water flow rate and design of the circulating water pumps determines the minimum water level needed over the intakes.

The effects of a 5-foot drawdown at the dam on the water surface profile of Pool 3 were simulated. Xcel Energy was consulted about the effects of an accidental drawdown of the pool that would result from an embankments failure at Lock and Dam 3. Xcel Energy responded that, with a 5-foot drawdown at Lock and Dam 3, both power plants would be forced to shut down. These two power plants generate about 40 percent of the electricity used in the Minneapolis-St. Paul Metropolitan Area.

Forced shutdowns of the power plants would represent the additional cost to Xcel Energy (and to the Nation) of shutting down and restarting the power plants and of procuring the power from alternate sources to replace that lost by the outage of these two plants. The estimates were derived by an internal analysis by Xcel Energy of the impacts of losing power production at the Prairie Island and the King plants. A weighted-average daily cost was estimated from the costs provided in Table 3-5 as $1,530,000. The number of days lost due to an accidental drawdown was given a lognormal distribution with a mean of 35 days, standard

deviation of 15 days, and a range of between 20 and 116 days. The same distribution for the number of days lost in a year due to outage was used for the King Plant. For this plant, the average daily cost associated with accidental drawdown was estimated as $790,000.

Table 3-5. Estimated costs of forced shutdown of the Prairie Island Nuclear Power Plant and the Allen S. King Generating Plant. Cost estimates provided by Xcel Energy.

Forced outage period (weeks)	Costs for April-May outages ($ million)	Costs for July-August outages ($ million)
3	23.3	45.2
4	30.0	57.4
5	36.0	58.1

According to Xcel Energy, the cost of buying replacement power would be $2,319,900 per day (2005 dollars). We consulted with the Mid-Continent Power Pool, a consortium of utilities based in the Twin Cities that regulates power distribution in the upper Midwest, and with the Corps of Engineers Hydropower Center of Expertise in Portland, Oregon, about the reasonableness of the estimate provided by Excel Energy. Both agreed that the cost estimates provided by Xcel Energy are reasonable.

Failure of the upper embankment would flood Marsh and Gantenbein Lakes to the level of Pool 3, elevation 975.0 feet msl. After flooding, Marsh Lake and Gantenbein Lake would be 1 foot and 2 feet deeper, respectively. Much of the submersed and emergent aquatic vegetation in the lakes would be killed. Most of the trees in the surrounding floodplain forest over several hundred acres would also be killed. The lakes would probably change from their existing emergent marsh ecosystem into deeper floodplain lakes, dominated by blue-green algae, with fewer aquatic plants. This change in ecosystem state would cause a marked decline in use by migrating waterfowl. Floodplain forest habitat used by migrating birds and resident wildlife would also markedly decline.

3.3.8 Future Without-Project Conditions – River Ecosystem

Many efforts to protect and restore the Upper Mississippi River ecosystem are underway. Water quality conditions have improved significantly in the last three decades and will probably continue to improve. Polychlorinated biphenyl (PCB) concentrations in the sediments and fish tissue are on the decline. Other emerging contaminants such as endocrine-disrupting compounds may be a problem in the future, affecting reproduction and growth of a variety of life forms. Walleye and sauger populations in Pool 4 remain strong and are expected to continue to support the popular sport fishery. Asian (silver and bighead) carp may prove to be very disruptive when they invade and establish reproducing populations in the upper river, competing for plankton food and space with native fish. The silver carp leap when startled and pose a safety threat to boaters. The Asian black carp eats molluscs and could adversely affect native mussels and snails.

Invasive zebra mussels have established reproducing populations in the UMR, but zebra mussel densities in the vicinity of Lock and Dam 3 remain fairly low, to the point that a species-rich mussel bed still occurs in the tailwater below Lock and Dam 3. With improving water quality

conditions, the native mussel populations should recover in areas where zebra mussel densities remain low. The federally-listed endangered mussel *Lampsilis higginsi* has recently been reintroduced to Pool 3.

The general plan form of the river near Lock and Dam 3 (shape of the channels, islands, and floodplain) is not expected to change significantly in the foreseeable future given the generally stable river channel plan form and the armoring by the channel training structures and revetments associated with the navigation project. Shoreline erosion would continue to occur, as it has along the lower embankment below Lock and Dam 3 (Figure 3-9) especially along unarmored banklines with high rates of recreational boating traffic (Johnson 1994, Landwehr and Nakato 1999).

The floodplain forest is in a stage of senescence and decline, with aging cottonwoods and silver maples. American elms are infested with Dutch elm disease and are dying. Recruitment of new trees is limited by dense reed canary grass. Impoundment for the navigation system and artificial impoundment of floodplain lakes as in the Gantenbein Lakes area have limited survival of less flood-tolerant and mast-producing trees like swamp white oak. Areas of more open floodplain forest with reed canary grass ground cover will occur without more active floodplain forest management.

Failure of the Wisconsin embankments would damage the river ecosystem as described in 3.3.7 above.

Land ownership and management of the floodplain areas near Lock and Dam 3 are unlikely to change much. The Prairie Island Indian Community land, the land associated with the Prairie Island Nuclear Power Plant and the Federal land around Lock and Dam 3 will continue in its present ownership and uses. The Cannon River Bottoms area has been protected from development by a conservation easement donated by the Red Wing Wildlife League. The privately-owned Gantenbein Lakes area on the Wisconsin side has been managed as a hunting area for many years. With the limited amount of hunting use on Marsh Lake, the Gantenbein Lake area effectively serves as a refuge for migratory waterfowl. The Gantenbein Lakes area will remain in private ownership or become publicly owned, but it will probably continue to be managed for wildlife and remain high quality floodplain wetland habitat until damaged by scour or flooding associated with an embankments failure as described in section 3.3.7 above.

Interagency efforts to protect and restore the river ecosystem are ongoing through the Upper Mississippi River System-Environmental Management Program (UMRS-EMP) and NESP. Objectives for future condition of the river ecosystem are being set and refined (Corps of Engineers 2000b, Fish and Wildlife Work Group 2004). Some ecosystem restoration projects may be implemented near Lock and Dam 3 in the foreseeable future.

Recreational boating is popular on the river and boating traffic is heavy on summer weekends. Recreational boating traffic in the Lock and Dam 3 area is forecast to increase along with the population of the Twin Cities Metropolitan Area (Carlson et al. 2000). An accidental drawdown of Pool 3 as described in section 3.3.7 above would close recreational boating on the river. Increased sediment resuspension from boat wakes (Knight and Parchure 2004) and continued shoreline erosion (Johnson 1994, Landwehr and Nakato 1999) will probably occur in the future.

CHAPTER 4. AFFECTED ENVIRONMENT

The affected environment is the area and resources that might be affected by navigation accidents, embankment failure or modifications to Lock and Dam 3. This chapter also serves to describe the existing "without project" conditions. The study area includes upper Pool 4 and Pool 3, extending along the Mississippi River from Red Wing to Hastings and up the St. Croix River to Stillwater. Marsh and Gantenbein Lakes and the adjacent floodplain on the Wisconsin side could be affected by changes to the embankments and are part of the study area. The environment of this area has been described in Collinsworth et al. 1973, Miller et al. 1973, WEST 2000, Corps of Engineers 1995a, Corps of Engineers 1995b, Corps of Engineers 2000b, Fish and Wildlife Work Group 2004, Dieterman 1995, and USGS 1998.

4.1 Social and Economic Conditions

4.1.1 Prairie Island Indian Community

The Mdewakanton Dakota Native Americans have lived in the region for many generations. Land on Prairie Island upstream of Lock and Dam 3 was purchased for the Prairie Island Indian Community under the Indian Reorganization Act of 1934. The Prairie Island Indian Community real estate consists of 571.2 acres of Tribal Trust land. The population of the community is about 200 people. The community is governed by a community council with a president and four other officers. It has established a community center, resort and casino, marina, tour boat business, recreational vehicle park, sports facility, and gas station-convenience store. The major economic activity is the resort and casino. In addition to the Tribal Trust land, the community has use of about 1,200 acres of Corps-owned property adjacent to the north boundary of the community. Congress has authorized the transfer of these 1,200 acres to the Bureau of Indian Affairs to be held in trust for the Prairie Island Community. A dredged access channel across Sturgeon Lake connects the Prairie Island Marina to the main channel of the Mississippi River just upstream from Lock and Dam 3.

4.1.2 Red Wing

The year 2000 population of Red Wing was 16,116, a 6.4 percent increase over 1990. The estimated population in July 2004 was 15,907, indicating a 1.3-percent decline since 2000. The primary employment is in manufacturing. The unemployment rate is about 3.5 percent.

Red Wing is the county seat for Goodhue County. The nearest city of comparable size is Hastings in Dakota County, Minnesota, about 15 miles to the north. Two rail lines, Amtrak, seven interstate truck lines, three bus lines including the municipal bus system, and an airstrip provide transportation. Eight motels and hotels have a total of 291 rooms. A library, 3 banks, 11 schools (including a technical college), and a daily newspaper are also in Red Wing. Health care is provided at a medical center and by 36 doctors and 16 dentists.

4.1.3 Commercial Navigation

Bulk cargo carriers use the Upper Mississippi River 9-Foot Channel Navigation Project and Lock and Dam 3 to transport farm products, fertilizer, chemicals, petroleum, coal, sand, gravel, and other commodities. Traffic rates through Lock and Dam 3 are described in section

3.3.2 above. The annual benefit of commercial navigation traffic through Lock and Dam 3 versus other modes of transportation is approximately $200 million. The bulk cargo carriers use steel barges with typical dimensions of 35 feet wide by 195 feet long and 9-foot draft when loaded. Towboats range from smaller harbor tugs to line towboats with over 5,000 horsepower. The nearest commercial harbor and port facilities to Lock and Dam 3 are in Red Wing.

4.1.4 Power Plants

The Prairie Island Nuclear Power Plant just upstream of Lock and Dam 3 (see cover page photo) is a two-unit 1,060-megawatt nuclear power plant with pressurized water reactors owned by Xcel Energy, Inc. The Allen S. King Generating Plant is located on the St. Croix River in Oak Park Heights, Minnesota. It is a single-unit, 529-megawatt coal-burning power plant also owned by Xcel Energy, Inc. Both power plants require minimum river water levels to withdraw cooling water and to dissipate thermal discharges. Together, these two power plants generate about 40 percent of the electricity used in the Minneapolis-St. Paul Metropolitan Area.

4.1.5 Recreational Resources

Excluding the St. Croix River, Pool 3 has eight boat accesses, seven in Minnesota. Of the 669 marina slips in Pool 3, 525 are in Minnesota. The pool has 36 day-use picnic sites and no overnight camping facilities. Islands with recently-placed dredged sand are used as undeveloped recreation areas along the river. The Corps maintains one two-lane boat launching ramp on Sturgeon Lake. No other recreational facilities are at that site.

Red Wing Harbor Park and Lake Rebecca Municipal Park in Hastings provide municipal day-use recreation facilities along the river.

Pool 3 has the third highest recreational boating traffic among navigation pools on the Upper Mississippi River. As many as 20,000 recreational boats pass through Lock and Dam 3 in a year. Most of the recreational boating activity on Pool 3 occurs in the vicinity of Hastings, and Prescott, Wisconsin, near the confluence of the Mississippi and St. Croix Rivers. In Pool 4, the tailwater of Lock and Dam 3 is very popular with anglers, and the river near Red Wing and Lake Pepin supports considerable recreational boating traffic. The Prairie Island Indian Community runs a tour boat out of the Prairie Island Marina.

Boating, fishing, bird watching, and hunting are the primary recreational activities on the Mississippi River and adjacent floodplain near Lock and Dam 3.

4.1.6 Cultural Resources

Archaeological research has been ongoing in the lower Pool 3 area since the mid-19th century, and the region is well known for its numerous archaeological sites. Most of this research has centered on mapping and excavating earthen mounds (over 2,000 mounds have been recorded in the region, one of the more dense concentration of mounds along the Upper Mississippi River) and investigating a series of large, often fortified, village sites related to the Mississippian/Oneota period (c. A.D. 1000-1300). Nevertheless, cultural resources investigations have identified human activity in the region spanning from the Late Paleo Indian period (c. 10,000 B.C.) through modern times (Lock and Dam 3, constructed in 1938). The suite

of identified archaeological sites within the region (approximately 100 sites are within a 3-mile radius of the lock and dam) include burials, burial mounds, isolated find spots, lithic scatters, artifact scatters, stone circles and cairns, petroforms, rock art, historic standing structures, historic artifact scatters, historic wing dams and a historic shipwreck. Numerous sites within the region are also listed on the National Register of Historic Places (NRHP), while several others have been determined eligible for listing on the NRHP. The cultural resources sites are on upland crests of the valley, a series of Late Pleistocene and Holocene terraces, tributary fans and deltas, natural levees along islands within the floodplain and within the channel.

A number of cultural resource investigations have been completed for the Wisconsin embankment repair projects at Lock and Dam 3 and other Corps activities in lower Pool 3. In 1986, Lock and Dam 3 was determined eligible for listing on the NRHP as part of the thematic group encompassing Locks and Dams 3 through 22. Although the Wisconsin embankments help to impound Pool 3, they do not contribute to the historic character of Lock and Dam 3. In 1994, the Institute for Minnesota Archaeology (IMA) conducted a geomorphologic investigation designed to assess the archaeological sensitivity in the vicinity of Lock and Dam 3. This investigation included a series of deep bore holes (about 3 meters) to examine stratigraphy. This study concluded that the natural levee systems in the area were relatively recent (e.g., 200 years) and that lower and wetter areas were probably active point bar systems. These areas were deemed to have little potential to contain intact cultural deposits predating 200 years before the present. Slightly higher areas near the prominent terrace and the area adjacent to the former Trimbelle River delta were considered to have a high potential to harbor intact, buried cultural horizons. Also in 1994, the IMA conducted shovel testing along the lower embankment access road from near the edge of the terrace and between Marsh and Gantenbein Lakes and conducted an evaluation of Site 47PI448. No cultural resource sites were identified along the access road. Site 47PI448 was determined eligible for listing on the NRHP.

While not associated with the embankment project, the Mississippi Valley Archaeology Center (MVAC) completed a shoreline survey of navigation Pool 3 of the Upper Mississippi River in 1995. No cultural resources were noted along the upper or lower embankments during this study. Between 2001 and 2003, the Corps commissioned Hess, Roise and Company to determine potential eligibility for channel constriction works of the Upper Mississippi River. This study concluded that surviving wing dams and other works are eligible for listing on the NRHP. The Corps and the State Historic Preservation Offices (SHPOs) of Minnesota, Wisconsin and Iowa remain in consultation over this matter.

In 2003, Corps archaeologists and Florin Cultural Resource Services completed a cultural resource survey along the upper and lower embankments and along a portion of the upper access road where it crosses the former delta of the Trimbelle River. No cultural resources were identified along the upper and lower embankments. A series of shovel tests and deep cores support the 1994 geomorphological assessment that the near surface (up to 3 meters) sediments along the upper and lower embankments are relatively recent in age. However, Site 47PI559 was identified near the base of a terrace on the former Trimbelle River delta along the northern reach of the upper embankment access road. Subsequent investigations determined that site 47PI559 is eligible for listing on the NRHP. A report with more detail about this site will be included as a cultural resources appendix to the final General Reevaluation Report and EIS.

4.1.7 Natural Resources

Floodplain and aquatic habitats in the project area are of good quality and support a diverse and abundant biota. Impoundment of Pool 3 by Lock and Dam 3 in 1938 flooded about 17,950 acres along the Mississippi River and raised Lake St. Croix about 5 feet, extending upstream to Stillwater. Aquatic habitat in the project area includes the main Mississippi River channel; channel borders with wing dams and rock revetments; the deep tailwater below the dam; and extensive backwater areas including the Vermillion River, Sturgeon Lake, the Cannon River Bottoms, and the Gantenbein Lakes.

4.1.7.1 Floodplain Habitat

The floodplain in the vicinity of Lock and Dam 3 is low and is seasonally flooded. The dominant trees are mature native trees, including silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), black willow (*Salix niger*) and box elder (*Acer negundo*), with some mature cottonwood (*Populus deltoides*) along the riverbanks. Some swamp white oaks (*Quercus bicolor*) and red oaks (*Quercus rubra*) occur on the highest floodplain ground. Erosion and embankment repairs have disturbed parts of the area close to the dam and between Gantenbein Lake and the main channel. These areas presently have an earlier successional stage of the same tree species along with stands of shrubby sand bar willow and red osier dogwood.

Ground cover over much of the area is mostly reed canary grass (*Phalaris arundinacea*) jewelweed (*Impatiens capensis*), wood nettle (*Laportea canadensis*), poison ivy (*Rhus radicans*) and wild grape (*Vitis sp*.). Areas with open tree canopy have dense stands of reed canary grass. The floodplain forest is low to tall broadleaf deciduous forest, open to dense, with woody vines often present.

4.1.7.2 Aquatic Habitat

The main channel habitats near Lock and Dam 3 are generally deep, with 1 to 3 feet per second current velocity (Gee and Wilcox 1985) over sand. The main channel borders range from shallow embayments to depths greater than 30 feet. Current velocities in the main channel borders are generally less than in the main channel because of eddies, wing dams, and spaces sheltered from the force of the current. A number of rock wing dams, closing dams and reaches of riprapped banks occur in the channel borders near Lock and Dam 3. The rock channel training structures and riprapped banks provide hard substrate in a river with little hard substrate except for woody debris. The tops of the wing dams are generally within several feet of the surface of low water, and they provide rock riffle habitat in an otherwise deep, sandy river.

The tailwater below Lock and Dam 3 extends downstream for about 0.5 mile. This area is greatly influenced by the dam and its operation, with fast currents, a 60-foot-deep scour hole, some wing dams on the right bank and reverse eddies near shore. This habitat is important because fish are concentrated there by the presence of the dam, which limits upstream migration and because it supports a popular sport fishery for walley and sauger.

The channel border along the Wisconsin bank below Lock and Dam 3 is a historically disturbed area. The shoreline was graded and riprapped during dam construction in 1937. Since then, the shoreline has eroded back significantly, narrowing the lower embankment (Figure 3-9 above). The riprap has largely disappeared into the tailwater or into the sandy substrate. The area close to the lock and dam was severely scoured during the 1993 navigation accident that overtopped the Wisconsin embankments. A line of rock riprap was placed along the former

bankline as part of emergency repairs in 1993. The channel border area downstream has eroded landward, leaving a sandy underwater bench with a vertical erosion scarp along the bank with exposed tree roots. Many floodplain trees along the shoreline have been lost to undermining by erosion and wind throw. The higher velocities in that area have swept much of the woody debris away, leaving a relatively homogeneous area without much hydraulic roughness. Fish have access to the irregularities of the present bank line and the emerging woody debris during higher levels of river discharge.

A numerical hydraulic model of Lock and Dam 3 was developed to assess the effects of potential hydropower development on habitat conditions in the tailwater (Gee and Wilcox 1983). A substrate survey was conducted upstream and downstream of Lock and Dam 3 with Ponar dredge grabs in a systematic trasect sampling design, visual classification of sediment with laboratory analysis of particle size gradation (Dewey 1985). The 1985 survey found a mostly sand substrate, with patches of sand and shell, and silty sand. A combination of depth, current velocity and substrate type was used to describe the dynamic habitat patch mosaic near Lock and Dam 3 and to assess the potential effects of changed flow pattern due to hydropower development on fish, macroinvertebrates, and the tailwater sport fishery.

A hydroacoustic fish survey of the tailwater was attempted to associate locations of fish aggregations with hydraulic and other habitat conditions (Wilcox 1987, 1988). Walleye and sauger were present in the tailwater as evidenced by angler catches and deep water electrofishing but because those species were very close to the bottom, the hydroacoustic fish survey equipment was unable to detect them. The hydroacoustic survey documented the distribution of fish higher in the water column like drum, white bass and gizzard shad. The distribution of fish (and fishermen) aggregating in the tailwater at Lock and Dam 3 is influenced by level of river discharge and hydraulic conditions in the tailwater.

A substrate survey of the Lock and Dam 3 tailwater was conducted in in 2003 to examine mussel habitat (Farr 2004). The 2003 survey was conducted from a boat using acoustic Doppler current profiling (ADCP) equipment and, a hydroacoustic survey system to characterize sediment type, and concurrent global positioning system (GPS) tracking. Boat tracks covered much of the tailwater (Figure 4-1). The survey was done to within about the 1 m depth contour along the left bank. The 2003 survey also found a mostly sand substrate with patches of sand and shell and silty sand.

More recent ADCP surveys of the river near Lock and Dam 3 have been conducted and used to calibrate 2-D numerical hydraulic models to quantify the flow pattern and assess the effects of alternatives for navigation safety and the embankments (Appendix H Hydraulics).

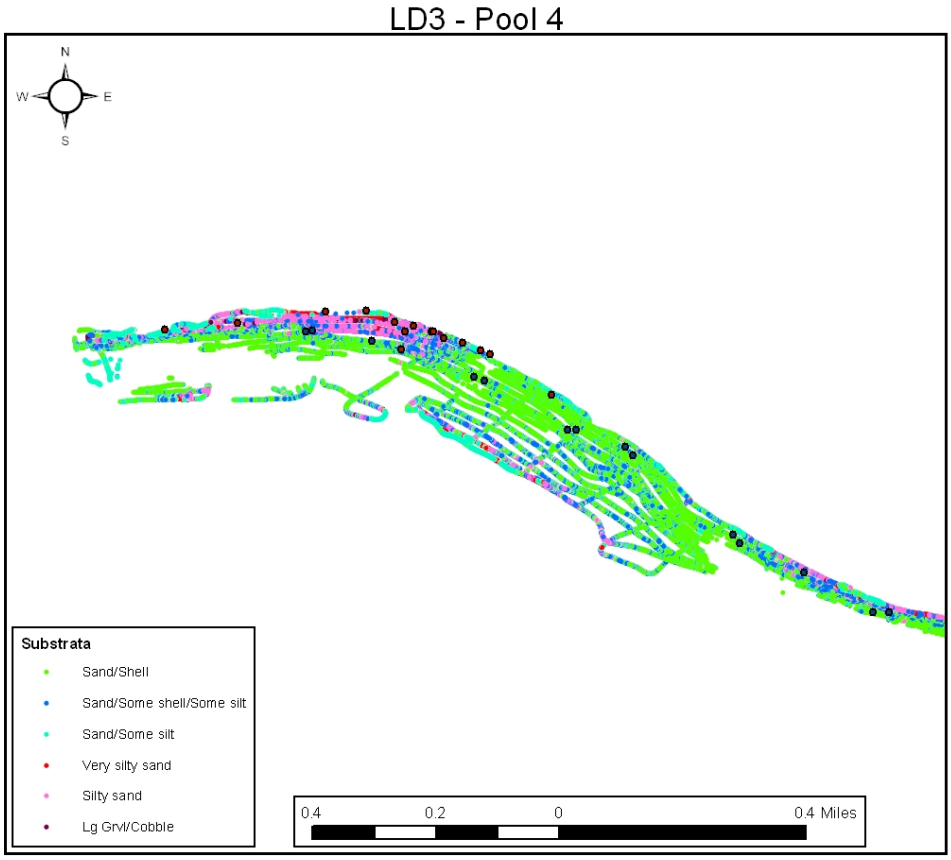


Figure 4-1. Substrate types in the tailwater of Lock and Dam 3, 2003. Dark dots are mussel sampling locations.

4.1.7.3 Wetland Habitat

The floodplain serves as an area of temporary storage of flood flows; energy is dissipated and the velocity of floodwater is slowed by floodplain vegetation. For these reasons, floodplain wetlands receive sediment and nutrients during periods of overbank flow, and decomposition products and detritus are washed into the river channels and moved downstream. Some of the floodplain wetlands near Lock and Dam 3 are maintained by local runoff and groundwater inflow during low flow periods. In addition to these hydrologic functions, floodplain wetlands provide important fish and wildlife habitat.

Table 4-1 shows the various types of habitat near the Wisconsin embankments. The Gantenbein lakes area wetland habitat consists of large open areas filled with submerged, floating-leaved, and emergent aquatic plants bordered by floodplain forest.

Table 4-1. Wetland types in the Gantenbein lakes area near Lock and Dam 3.

Wetland type	Acres
Floodplain forest (total)	616
Floodplain forest around Marsh Lake	336
Floodplain forest around Gantenbein Lake	280
Open water/emergent wetlands (total)	876
Open water and emergent wetlands (Marsh Lake)	720
Open water Gantenbein Lake	118
Emergent wetlands Gantenbein Lake	38
Reed canary meadow (along embankment)	15
Ephemeral ponds	1.08
River channel and scour area	9.6

The backwater wetlands on the Wisconsin side are slightly lower in elevation and are flooded longer than the wetlands in Minnesota near Lock and Dam 3 in the lower Vermillion and Cannon River area. They are more open, contain less brush, and have fewer backwater channels. Main channel border openings occur below Diamond Bluff (river mile 799.5) and just below Lock and Dam 3, providing direct connections to the main channel. The spot dikes from river miles 798.5 through 799.5 allow considerable flow into Marsh and Gantenbein Lakes when the pool elevation exceeds 675 feet msl.

Floating and submerged species, water lily (*Nymphaea spp.),* coontail (*Ceratophyllum demersum*)*,* pondweeds (*Potamogeton spp.*)*,* duckweed (*Lemnaceae spp.*), sparse wild celery (*Vallisneria americana*), and water stargrass (*Heteranthra dubia*), occur in approximately 120 acres in Gantenbein Lake. Emergent vegetation, mainly cattail (*Typha spp.*), bulrush (*Scirpus spp.*)*,* arrowhead (*Sagittaria latifolia*) and wild rice (*Zizania aquatica*), covers 720 acres in Marsh Lake and about 38 acres around the open water of Gantenbein Lake. Floodplain forest is found on about 610 acres of the 1,500-acre general project area bordered by the main channel, Mero Bluff, and the Trimbelle River. The forest continues through the Trimbelle River bottoms well downstream of the project area. Within the general area, the floodplain forest is found along the main channel border, along meander scrolls and other higher areas.

4.1.7.4 Water Quality

Nonpoint source inputs from tributaries, major point source discharges, and river flow are the dominant factors influencing water quality in the Mississippi River near Lock and Dam 3. Nonpoint source pollution from the Minnesota River and wastewater discharges from the Twin Cities Metropolitan Area influence water quality near Lock and Dam 3.

Point source pollutant abatement activities implemented in the 1980s have noticeably reduced total and un-ionized ammonia nitrogen concentrations and increased dissolved oxygen (DO) concentrations in and downstream of the Twin Cities Metropolitan Area. Infestations of zebra mussels in Pool 3 that occurred in the 1990s have not reached densities observed downriver in Lake Pepin and below and have apparently not had much influence on water quality near Lock and Dam 3.

Water quality in the Mississippi River at Lock and Dam 3 has good DO concentrations year-round. Turbidity is relatively high because of the sediment contributed by the Minnesota

River. Water temperature is elevated by the thermal discharge from the Prairie Island Nuclear Power Plant, which keeps the river free of ice all winter.

Turbidity remains fairly high near Lock and Dam 3 as a result of fine sediment loading from the Minnesota and Vermillion Rivers, wind-driven sediment resuspension in Sturgeon Lake, and algae blooms. The high ambient turbidity limits growth of submersed aquatic plants in lower Pool 3.

4.1.7.5 Contaminants

Contaminants in the Mississippi River include PCB's, mercury, and a number of organic compounds associated with industrial and municipal wastes. Historically, PCB's and mercury have been the primary contaminants of concern, prompting fish consumption advisories by the Minnesota Department of Health and the WDNR. Emerging contaminants of concern include endocrine-disrupting and perfluoronated compounds.

The Minnesota Department of Health and the WDNR reported that median PCB concentrations in fish fillets were greatest in the Pool 2 to Pool 4 reach in the early 1980s. PCB sources in this river reach are generally attributed to diffuse inputs from the Twin Cities Metropolitan Area. Fish tissue PCB concentrations have decreased noticeably river-wide from the early 1980s. These reduced PCB tissue concentrations probably reflect use restrictions, reduced point source contributions, and reduced nonpoint source inputs associated with soil or sediment cleanup activities.

Median mercury concentrations in channel catfish and white bass fillets were greater in the upper portion of the river (Pools 2 through 6). Mercury concentrations appear to be exhibiting a declining trend, consistent with reduced mercury inputs as documented by recent sediment coring studies of Lake Pepin (Balogh et. al., 1999).

4.1.7.6 Fish

From Pool 3, 68 species of fish have been reported, and 83 species have been reported from Pool 4. The most abundant fish by numbers and mass near Lock and Dam 3 may be gizzard shad (*Dorosoma cepedianum*). The shad are filter feeders that are prey to many other species of fish and birds. Carp (*cyprinus carpio*), buffalo (*Ictiobus spp.*), and carpsuckers (*Carpiodes spp.*) are common rough fish in the backwater areas near Lock and Dam 3. Walleye (*Stizostedion vitreum*), sauger (*Stizostedion canadense*), crappie (*Pomoxis spp.*), white bass (*Morone chrysops*), northern pike (*Esox lucius*), smallmouth bass (*Micropterus dolomieu*) and bluegill (*Lepomis macrochirus*) are the most commonly caught game fish. Channel catfish (*Ictalurus punctatus*), flathead catfish (*Pzlodictus olivaris*), walleye, sauger, shovelnose sturgeon (*Scaphirhyncus platorynchus*), lake sturgeon (*Ascipenser fulvescens*), shorthead redhorse (*Moxostoma macrolepidotum*), white bass, and smallmouth bass (*Micropterus dolomievi*) are fishes adapted to lotic conditions that make use of the faster flowing habitats near Lock and Dam 3. Walleye, sauger and white bass are migratory species that congregate in the dam's tailwater because of the partial barrier to upstream movement imposed by the dam. This concentration of fish makes the tailwater area popular for sport fishing.

The tailwater and channel borders downstream are a staging area for walleye and sauger prior to spawning. Sauger spawn on gravel areas in the tailwater. Walleye have been observed spawning over the intermediate embankment between Gantenbein and Marsh Lakes

and along riprapped banks and in flooded reed canary grass. White bass are common in the tailwater area during the summer. Little sport fishing takes place immediately upstream of Lock and Dam 3, primarily because of the presence of the dam. The tailwater supports a popular and economically important sport fishery because of the concentration of fish, a continuous (no closed season) fishery, and proximity to the Minneapolis-St. Paul Metropolitan Area.

Catfish aggregate for winter in a deep hole in the channel border near Diamond Island. (Talbot 1979).

4.1.7.7 Aquatic Macroinvertebrates

Net spinning caddis flies of the genus *Hydropsyche* are common on hard substrates in the Mississippi River near Lock and Dam 3. In slower moving water, *Hexagenia* mayfly larvae live in burrows in the mud and filter particulate matter from the water by pumping it through their burrows. Aquatic worms (Oligochaetes) and midge larvae (Dipterans) are common in the silty substrate areas. The native mussel and fingernail clam fauna, severely depleted by pollution, is starting to recover. Many species of aquatic insects and small crustaceans exist in the river near Lock and Dam 3, feeding on algae and particulate organic matter. The macroinvertebrates process plant and organic particulate matter, providing food for fish and birds.

4.1.7.8 Mussels

Quantitative mussel surveys were conducted in the tailwater area (Figure 4-2) in 1999 and 2000 (Farr 2001). The Lock and Dam 3 tailwater area supports one of the most species-rich mussel assemblages in the Upper Mississippi River. Previous sampling efforts by the WDNR (Thiel 1981) did not provide any evidence of a well-developed mussel assemblage within the upper reaches of Pool 4. However, a total of 220 mussels representing 13 species were found in the St. Paul District mussel dredge sampling in the Wisconsin side of the tailwater in May 1999 (St. Paul District, unpublished data).

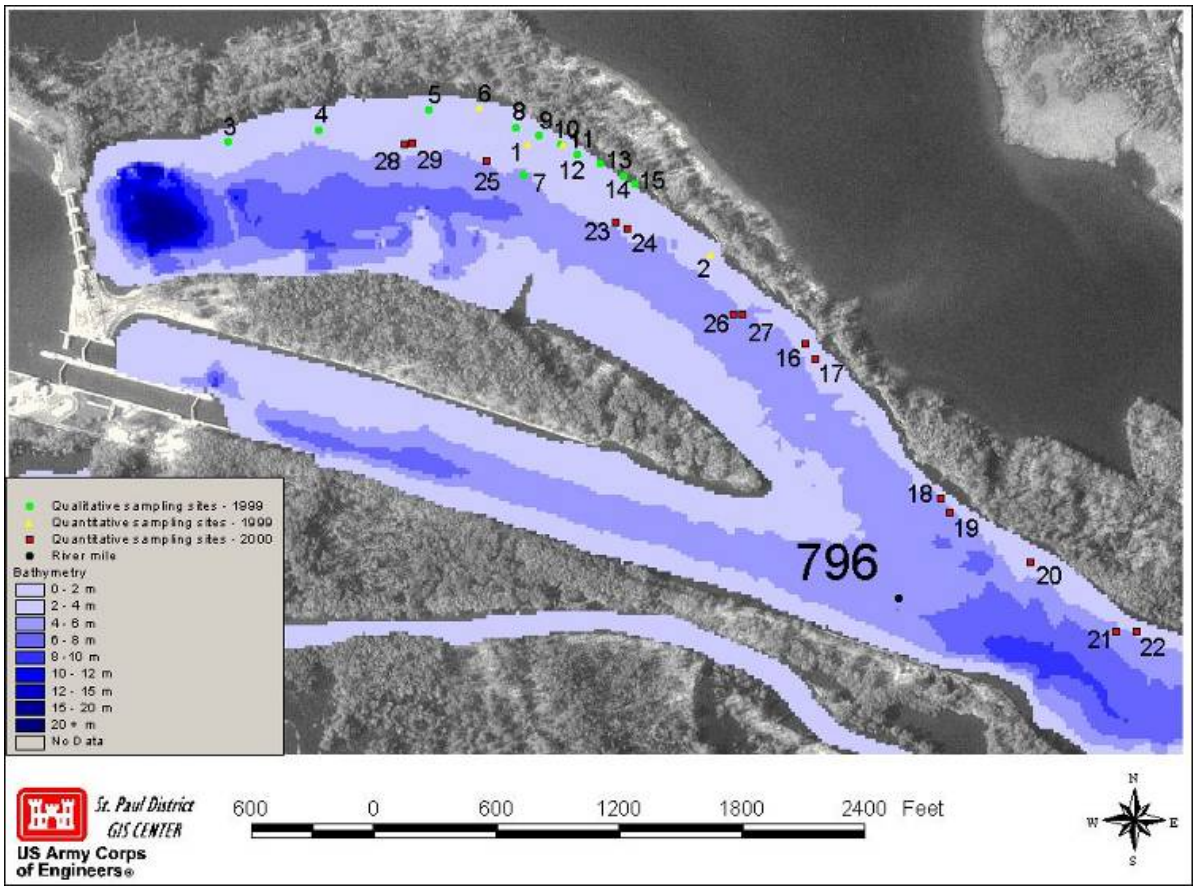


Figure 4-2. Mussel sampling locations during 1999 and 2000 surveys in the tailwater of Lock and Dam 3.

The most numerically dominant species in qualitative samples were *Obliquaria reflexa, Amblema plicata, Fusconaia flava, Quadrula pustulosa* and *Truncilla truncate.* Qualitative data obtained from nearshore (6- to 8-foot depth) and channel samples (10- to 12-foot depth) collected during summer 1999 indicated very little difference among mussels located above and below the depth gradient Although three species were unique to both nearshore (*Actinonaias ligamentina, Legumia recta* and *Obovaria olivaria*) and channel (*Strophitus undulatus, Truncilla donaciformis* and *Anodonta suborbiculata*) samples, over 99 percent of individuals were from the other 14 species collected at both depths. Species diversity (1.62 and 1.51), evenness (0.57 and 0.53) and "catch per unit effort" (1.6 and 1.48) showed relatively little difference between nearshore and channel samples, respectively.

Species with the greatest density and relative abundance estimates in quantitative samples were *T. truncata, O. reflexa, F. flava, A. plicata* and *Q. pustulosa*. In 1999, quantitative samples contained mussels from 16 species, whereas representatives of 14 species were collected in 2000 samples.

The most common species collected showed substantial evidence of recent recruitment. Among the six most abundant species collected in 1999 quantitative samples, percent individuals less than 30 millimeters (mm) in shell length ranged from 7.6 in *O. reflexa* to 87.2 in

T. truncata; the range from similar analyses of 2000 quantitative data was from 13.0 in *O. reflexa* to 91.7 in *T. truncata.*

Three Wisconsin State threatened species were present in samples collected in the area immediately downriver of Lock and Dam 3. Ten *Quadrula metanevra*, six *Quadrula nodulata* and one *T. verrucosa* were collected during the current survey. However, no State or federally listed endangered species were collected in the study area.

Two non-indigenous bivalve species were present among various samples. *Corbicula fluminea* (Asianic clam) and *Dreissena polymorpha* (zebra mussel) were both present in low numbers. Although *Corbicula* poses little or no threat, *Dreissena* can have substantial lethal and nonlethal effects on native mussel assemblages (Hornbach 2001). Zebra mussel abundance was not great enough to warrant great concern for the welfare of unionid mussels. However, future increases in zebra mussel densities may warrant conservation efforts for native mussels downstream of Lock and Dam 3.

A qualitative mussel survey was conducted in the tailwater in August 2004 to determine the landward boundary of the mussel bed along the left descending (Wisconsin) bank. A diver searched along transects perpendicular to the bank at a number of points (Figure 4-3). The landward boundary of the mussel bed was delineated using a global positioning system (GPS). The landward boundary of the mussel bed was used to ensure that layout of the lower embankment construction work avoided encroaching on the mussel bed (see section 6.1.2).

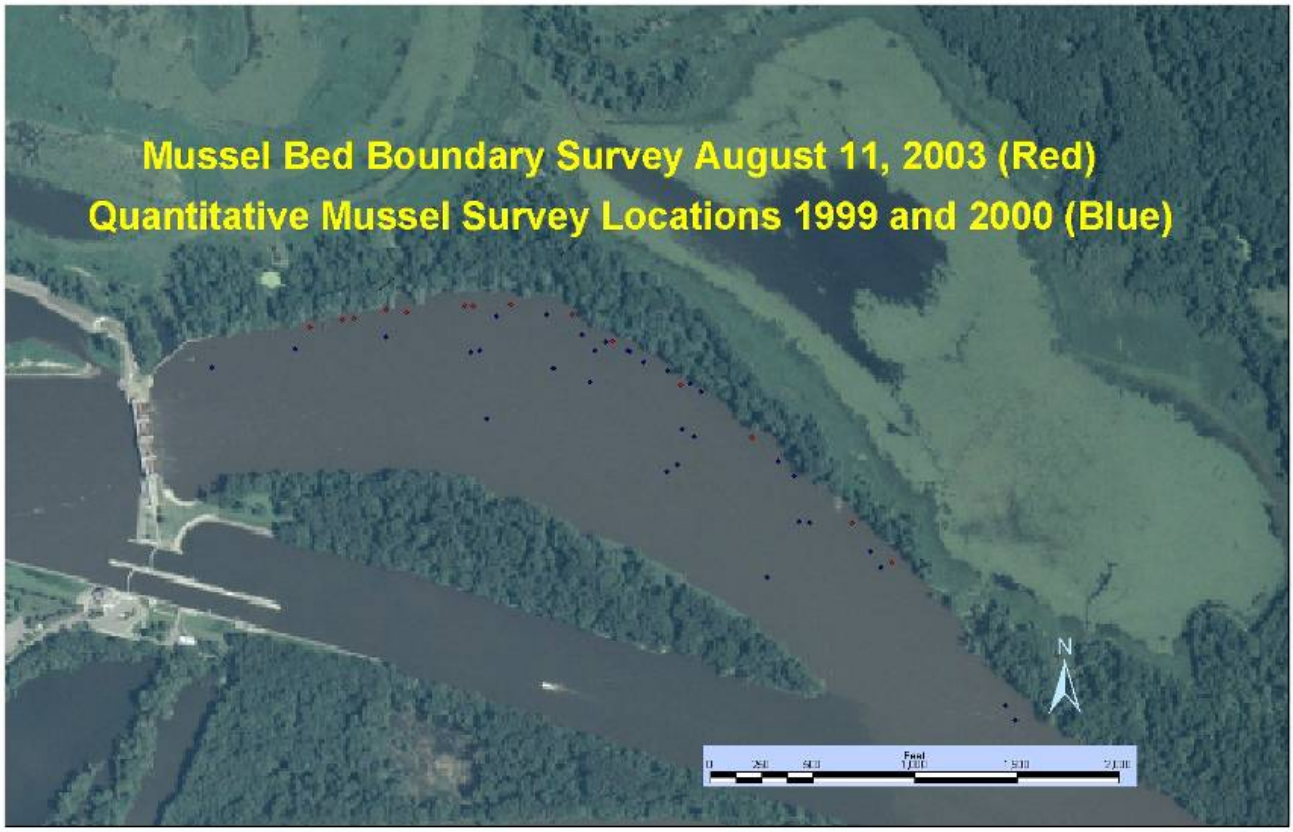


Figure 4-3. Location of mussel transect surveys (red) to determine landward boundary of the mussel bed along left descending bank in tailwater below Lock and Dam 3. August 2003

Mussel dredge (Miller et al. 1989) sampling runs (Figure 4-4) were made in Pool 3 in

1999 and 2000 in the area upstream of Lock and Dam 3 in the areas that could be affected by navigation safety improvement work (guide wall extension, channel modifications, see section 6.1.1 below). Only two live mussels were found (one *Quadrula quadrula* and one *Potamilus ohiensis*), indicating a very depauperate mussel community in lower Pool 3 near Lock and Dam 3.

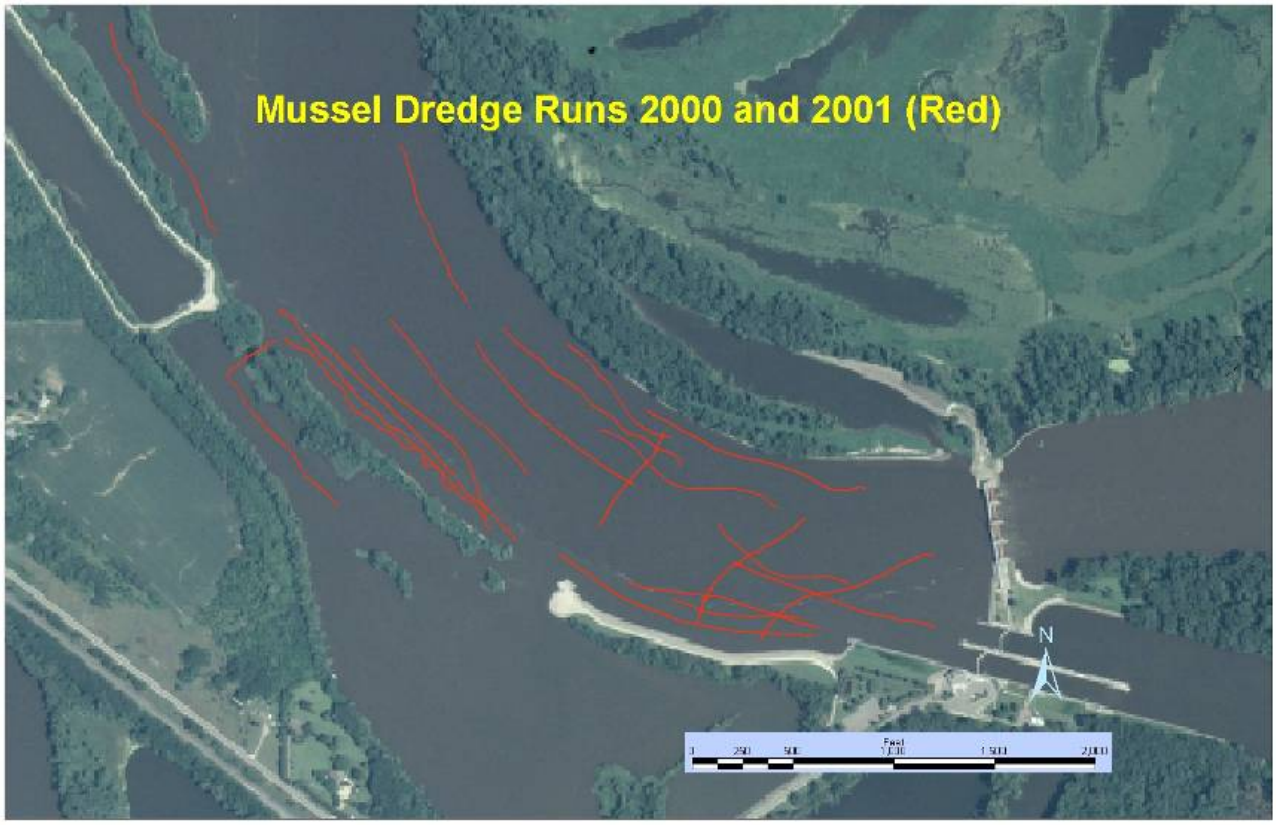


Figure 4-4. Mussel dredge sampling locations in Pool 3 above Lock and Dam 3 in 2000 and 2001.

4.1.7.9 Wildlife

The variety of habitats and vegetation cover types in the vicinity of Lock and Dam 3 supports many species of wildlife. The interspersion of agricultural areas, upland meadow, old fields, bottomland hardwoods, emergent wetlands, and open water creates a mosaic of habitat types satisfying the requirements of a broad range of species. The MnDNR manages much of the area west of Lock and Dam 3 as the Gores Wildlife Management Area. The Cannon River Bottoms is a protected area owned and managed by the Red Wing Wildlife League. The Gantenbein Lakes area is owned by the Diamond Bluff Associates and is managed as a hunting area and as a refuge for migratory waterfowl. Corps-owned land immediately adjacent to Lock and Dam 3 is managed for lock and dam operations; the rest is managed for natural resources and public use.

Mammals known or likely to occur throughout the project area include white-tailed deer (*Odocoileus virginianus*), red fox (*Vulpes fulva*), raccoon (*Procyon lotor*), woodchuck (*Marmota*

monax), striped skunk (*Mephitis mephitis*), fox squirrel (*Sciurus niger*), gray squirrel (*S. carolinensis*), red squirrel (*Tamiasciurus hudsonicus*), eastern cottontail (*Sylvilaqus floridanus*) and coyote (*Canis latrans*). Mammals associated primarily with aquatic habitats in the project area include mink (*Mustela vison*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), and river otter (*Lutra canadensis*).

Bird species diversity within the project area is high because of the variety of habitat types available and the site's location on a major migration route. Over 120 species of birds are known to nest along the Upper Mississippi River. Several species of raptors, various game birds (such as ring-necked pheasant (*Phasianus colchicus*) and ruffed grouse (*Bonasa umbellus*)), woodpeckers, and many species of passerines use the upland areas. The floodplain supports many species of neotropical migrating birds. Aquatic areas at the site provide habitat for shorebirds, colonial wading birds, and waterfowl.

4.1.7.10 Federally Listed Threatened and Endangered Species

The following federally-listed threatened and endangered species may occur along the Upper Mississippi River:

Species	Status
Bald eagle (*Haliaeetus leucocephalus*)	Threatened
Higgins' eye pearlymussel (*Lampsilis higginsi*)	Endangered

The bald eagle is a year-round resident that nests in several locations near Lock and Dam 3. Nesting sites are across the river in the Vermillion River bottoms within 3/4 mile of the lock and dam and on the Wisconsin side 2 miles upstream of the dam on the spot dikes. The Gantenbein Lakes area is used extensively by bald eagles. Eagles are regularly present in lower Pool 3 and upper Pool 4 during winter because open water is maintained by power plant thermal discharge.

Since the late 1970’s, no records show the presence of the Higgins' eye pearlymussel near the project site. Mussel surveys done at that time (Fuller 1980) showed a limited mussel fauna in Pool 3. Mussel surveys were done by the St. Paul District in 1986, 1999, 2000, 2003 and by the MnDNR and Northern States Power Company (now Xcel Energy) in 1979. These surveys did not reveal any Higgins' eye pearlymussels in the area around Lock and Dam 3. Lampsilis higginsi have been cultured and recently re-introduced into lower Pool 4 and upper Pool 3.

4.1.7.11 State Listed Threatened and Endangered Species

Threatened and endangered species listed by the WDNR and MnDNR that may occur in the project area are shown in Tables 4-2 and 4-3, respectively. A survey of plant species has not been conducted in the project area.

Table 4-2. Wisconsin threatened and endangered species that may occur in the project area. END = endangered, THR = threatened

Birds		**Status**
Cygnus buccinator	trumpeter swan	END
Falco peregrinus	peregrine falcon	END
Lanius ludovicianus	loggerhead shrike	END
Sterna forsteri	Forster's tern	END
Ardea alba	great egret	THR
Buteo lineatus	red-shouldered hawk	THR
Dendroica cerulea	cerulean warbler	THR
Nyctanassa violacea	yellow crowned night heron	THR
Pandion haliaetus	osprey	THR
Fish		
Hiodon alosoides	goldeye	END
Luxilus chrysocephalus	striped shiner	END
Moxostoma duquesnei	black redhorse	END
Notropis amnis	pallid shiner	END
Cycleptus elongatus	blue sucker	THR
Lepomis megalotis	longear sunfish	THR
Macrhybopsis aestivalis	shoal chub	THR
Moxostoma carinatum	river redhorse	THR
Moxostoma valenciennesi	greater redhorse	THR
Notropis anogenus	pugnose shiner	THR
Polyodon spathula	paddlefish	THR
Mussels		
Cumberlandia monodonta	spectacle case	END
Ellipsaria lineolata	butterfly	END
Lampsilis higginsii	Higgins' eye	END
Arcidens confragosus	rock pocketbook	THR
Quadrula metanevra	monkeyface	THR
Quadrula nodulata	wartyback	THR
Simpsonaias ambigua	salamander mussel	THR
Tritogonia verrucosa	buckhorn	THR

Table 4-3. Minnesota threatened, endangered, and special concern species that may occur in the project area. END = endangered, THR = threatened, SC = special concern

Birds		**Status**
Falco peregrinus	peregrine falcon	THR
Haliaeetus leucocephalus	bald eagle	SC
	cerulean warbler	
Reptiles		
Clemmys insculpta	wood turtle	THR
Chelydra serpentina	snapping turtle	SC
Apalone mutica	smooth softshell	THR
Fish		
Cycleptus elongatus	blue sucker	SC
Alosa chrysochloris	skipjack herring	SC
Notropis amnis	pallid shiner	SC
Scaphirhynchus platorynchus	shovelnose sturgeon	SC
Opsopoeodus emiliae	pugnose minnow	SC
Ictiobus niger	black buffalo	SC
Polyodon spathula	paddlefish	THR
Acipenser fulvescens	lake sturgeon	SC
Ammocrypta asprella	crystal darter	SC
Mussels		
Lampsilis teres	yellow sandshell	END
Alasmidonta marginata	elktoe	THR
Pleurobema coccineum	round pigtoe	THR
Lampsilis higginsi	Higgins' eye	END
Arcidens confragosus	rock pocketbook	END
Elliptio dilatata	spike	SC
Actinonaias ligamentina	mucket	THR
Megalonaias nervosa	washboard	THR
Quadrula metanevra	monkeyface	THR
Ellipsaria lineolata	butterfly	THR
Ligumia recta	black sandshell	SC
Obovaria olivaria	hickorynut	SC
Quadrula nodulata	wartyback	END
Tritogonia verrucosa	pistolgrip	THR
Cyclonaias tuberculata	purple wartyback	THR
Plethobasus cyphyus	sheepnose	END
Elliptio crassidens	elephant-ear	END
Fusconaia ebena	ebonyshell	END

This page intentionally left blank.

CHAPTER 5. PLAN FORMULATION

5.1 Identification and Screening of Alternative Measures

Alternative measures to improve navigation safety and strengthen the Wisconsin embankments were identified in previous studies. The reevaluation study PDT and stakeholders identified additional alternative measures. The alternative measures were individually examined and screened to determine if they would be retained for further consideration. Screening criteria included the degree to which the alternative measures would contribute to attaining the planning objectives, engineering feasibility, and potential for risk reduction, environmental effects, cost, and institutional and public acceptance.

Alternatives to improve navigation safety and the Wisconsin embankments were designated N = navigation and E = embankments. Structural and nonstructural alternative measures have been considered and designated N = nonstructural and S = structural.

The no-action alternative, (doing nothing further to improve navigation safety and the Wisconsin embankments) serves as the baseline future without-project condition for evaluating the other alternatives. The no-action alternatives for navigation and the embankments have been designated NN1 and EN1, respectively.

Estimated costs of the alternative measures provided below are based on January 2006 price levels.

5.1.1 Navigation Safety Improvement Alternative Measures

A list of the alternative measures to improve navigation safety is provided in Table 5-1. A description and screening of the alternative measures follows, with reasons for dropping or retaining them for further consideration. Further technical discussion of the alternative measures is provided in the hydraulics appendix (Appendix H).

Table 5-1. Alternative measures to improve navigation safety at Lock and Dam 3.

Nonstructural measures	
NN1	No action
NN2	Increase pilot awareness
NN3	Restrict navigation
NN4	Require helper boat
NN5	Close dam gates temporarily
Hydraulic modifications to reduce outdraft current	
NH1	Bendway weirs
NH2A	Add wing dams
NH2B	Remove wing dams
NH3	Excavate to widen channel
NH4	Additional dam gates
NH5/ES5	Additional spillway
Barrier alternatives	
NB1	Rock jetty
NB2	Cell-type guard wall
NB3	Rock mounds to protect dam
NB4	Cells to protect dam
NB5	Cable across dam
NB6	Guide cable upstream of lock
Other alternatives	
NO1	Extend upper guide wall
NO2	Extend upper intermediate lock wall
NO3	Enlarge lake opening

5.1.1.1 Nonstructural Measures

NN1– No Action

Under this alternative, no additional action would be taken to reduce the risk of navigation accidents. Under the existing and future without-project conditions, a number of measures are being and will be taken to reduce navigation accidents (see section 3.3 above). Towboat pilots are highly trained and licensed. The Corps of Engineers notifies towboat pilots when outdraft conditions are present at Lock and Dam 3. Towboat operators make voluntary use of a helper boat during outdraft conditions. The RIAC, a towing industry organization, the USCG and the Corps prepared a Waterway Action Plan for the Upper Mississippi River that addresses navigation safety problems and identifies navigation practices and communications to improve navigation safety.

The no-action alternative would not include any cost for new construction or non-structural measures to improve navigation safety at Lock and Dam 3.

Stakeholders see the need to reduce the risk of navigation accidents. The no-action alternative does not include any measures to improve navigation safety and, therefore, would not meet the planning objectives for this project.

Retain for further consideration? Yes. The no-action alternative would not be used in formulation of alternative plans (e.g., no action on navigation safety improvements combined with strengthening the Wisconsin embankments). Combination navigation safety improvement and embankments plans are needed to meet the planning objectives. Stand-alone navigation safety improvement and stand-alone embankments strengthening measures would not acceptably reduce the risk of the related problems. The no-action navigation alternative measure will be used (in combination with no action to improve the Wisconsin embankments) as the without-project future baseline condition for evaluating the alternatives.

NN2 – Increase Pilot Awareness

Under existing and in the future without-project condition, the Corps of Engineers informs towboat pilots of the presence of the outdraft condition. Towboat pilots are highly trained, licensed, and experienced. They communicate extensively with other pilots, towing industry organizations and Corps of Engineers lockmasters.

Additional information would be made available to pilots about the outdraft problem at Lock and Dam 3. The information would be made available through routine navigation notices, a signal at Lock and Dam 2, the RIAC, and radio communication between lock operators and pilots. A Notice to Navigation is posted on the St. Paul District internet site and is distributed to the commercial navigation industry.

It would cost approximately $2,000 per year to further inform towboat pilots.

Towboat pilots are already acutely aware of the outdraft problem at Lock and Dam 3. Increasing pilot awareness is not expected to reduce the risk of an accident significantly.

Retain for further consideration? No. Pilots are already well-aware of the outdraft situation.

NN3 – Restrict Navigation

This alternative would restrict down bound tows to a maximum of six barges during outdraft conditions.

Under existing and the future without-project conditions, the towing industry voluntarily restricts the size of down bound tows to 12 barges when tows are made up in St. Paul during outdraft conditions at Lock and Dam 3. Down bound pilots voluntarily use helper boats to assist in entry to the lock. The USCG, RIAC and the Corps prepared a Waterway Action Plan for the Upper Mississippi River that addresses voluntary navigation safety practices.

Restricting navigation by reducing the number of allowed barges per tow during outdraft conditions would reduce the potential for navigation accidents for individual tows because tows would be more maneuverable. However, a smaller number of barges per tow would result in more tows and an offsetting increased potential for navigation accidents. The towing industry is generally against further restrictions to navigation.

Further restricting down bound tows during outdraft conditions to six barges per tow would cost the towing industry approximately $1.153 million per year. This cost includes the cost of additional towboat trips resulting from the reduced number of barges per tow.

Retain for further consideration? No, for technical and cost reasons. The towing industry is already restricting navigation during outdraft conditions at Lock and Dam 3 voluntarily. Further restrictions on down bound navigation during outdraft conditions would be costly. The benefits of reduced potential for accidents per tow would be offset by the increased number of down bound tows and associated increased risk of navigation accidents.

NN4 – Require Use of Helper Boat

This alternative would require that a helper boat be present and assist with all lockages during outdraft conditions. A privately-owned helper boat is currently being used voluntarily by towboat operators during outdraft conditions. The voluntary use varies from year to year but averages about 56 percent. Towboat operators estimate that the helper boat prevents 90 percent of accidents that might otherwise occur. Accidents can and have occurred with the helper boat in use.

ARTCO (a subsidiary of Archer Daniels Midland, Inc.) presently operates the helper boat at Lock and Dam 3 (Figure 3-3) and is committed to continuing the service. The vessel currently being used as a helper boat at Lock and Dam 3 is the MV Little Charlie, a twin screw 1000 horsepower towboat. The voluntary use of a helper boat already reduces but does not eliminate the risks of navigation accidents. Towboat pilots estimate that helper boat use reduces the risk of navigation accidents considerably If the use of helper boats were required, the estimated risk reduction of an accident would be between 20 and 40 percent. This alternative would have a relatively high cost resulting from the need to have a manned vessel available 24 hours a day.

The St. Paul District Office of Counsel prepared a legal opinion about Corps of Engineers authorities and policies regarding helper boat use. In summary, it is clearly within Corps authorities to allow private voluntary use of a helper boat, which is currently being done. The difficulty is that it is voluntary and continued voluntary use of a helper boat would not reduce the navigation safety problem if a towboat operator chooses not to use a helper boat.

Under 33 U.S.C. § 1, it is the duty of the Secretary of the Army to prescribe regulations for navigation as public necessity may require for the protection of life and property. The Secretary of the Army has the authority to prescribe any regulation the Secretary deems prudent to protect life, property or the operations of the lock and dam. Therefore, the Secretary may require the use of helper boats at locks and dams.

The navigation regulation that pertains to Lock and Dam 3 is 33 C.F.R. 207.300. It does not have any specific provision about helper boats. Lockmasters' ability to require the use of a helper boat is limited to but includes situations that could be described as an "emergency" or situations that may "prevent unnecessary delay in entering or leaving locks." The navigation safety problem at Lock and Dam 3 is a chronic problem, not an emergency. Although use of a helper boat tends to reduce the time that it takes for down bound tows to approach and enter the lock during outdraft conditions, navigation delays are generally not a problem at Lock and Dam 3. Absent the presence of either of those situations, under present regulations, the Corps lockmaster does not have authority to compel the use of a helper boat.

The Corps is authorized to operate and maintain Lock and Dam 3. That authority does not impose any restriction on the Corps that would prohibit the furnishing of helper boats. Were it determined that helper boats were needed to ensure safe passage, authority exists to provide them. However, as discussed above, under present regulations, tows could not be forced to use the assist boat unless an emergency situation were present or the helper boat was necessary to assure unnecessary delays would not occur. Were the Corps to supply helper boats, it would be exposed to an increased liability risk, both with respect to damage to Corps facilities and to the tows.

The USCG has navigation safety as one of its primary missions. The USCG may have the authority to require towboat operators to use a helper boat during outdraft conditions at Lock and Dam 3. Use of a helper boat at Lock and Dam 3 during outdraft conditions is not mentioned in the Waterway Action Plan (USCG 2006).

The cost of providing a helper boat is about $900,000 per year and consists of the cost to lease, provision, and crew a helper boat by private charter.

Retain for further consideration? Yes. A privately owned and operated helper boat is being used voluntarily during outdraft conditions at Lock and Dam 3. The helper boat owners have inidicated that they will continue to provide the service. Helper boat use by down bound tows during outdraft conditions (river discharge greater than 21,000 cfs) has varied between 19.4 and 76.9 percent in recent years, averaging 53.3 percent (Figure 3-12). The towing industry will continue to make voluntary use of a helper boat until they determine that it is not needed. Increased use of a helper boat during outdraft conditions would contribute to reducing the risk of navigation accidents.

Of the 65 outdraft-related navigation accidents that have occurred during the period from 1963 through 2005, 14 have occurred when the helper boat was being used (Table 3-1, Figure 3-13). Although increased helper boat use would help reduce the risk of navigation accidents, requiring helper boat use would not sufficiently improve navigation safety and reduce the risk of navigation accidents, which would continue to occur with a helper boat in use. A more complete solution to the navigation safety problem at Lock and Dam 3 is needed.

As an interim measure until navigation safety improvements are constructed, the St. Paul District will pursue complete voluntary compliance by the towing industry for helper boat use during outdraft conditions (river discharge greater than 21,000 cfs) for down bound tows approaching Lock and Dam 3 with six or more loaded barges.

NN5 Close Dam Gates Temporarily

The outdraft current becomes a problem at about 21,000 cfs. It would be possible to temporarily close dam gates to reduce flow through the dam and the severity of the outdraft current while towboats are in the lock approach.

Analysis of how this action could be conducted is documented in the hydraulics appendix (Appendix H). This analysis indicates that, as long as the river discharge is below 25,000 cfs and the tow is able to get into the lock within 1 hour, it is possible to perform the partial closure without forcing flow over the spot dikes in the Wisconsin embankments. For a river discharge of 30,000 cfs, it would be difficult not to cause some overtopping of the spot

dikes even when the tows make it into the lock in 30 minutes. The analysis also indicates that the partial closure operation would take 2.5 to 3.7 hours for a river discharge of 25,000 cfs and 3.7 to 4.7 hours for a river discharge of 30,000 cfs.

During busy traffic days, the gate would have to be closed and opened many times, requiring an additional lock operator to accomplish the actions. Frequent changes in flow through the dam could adversely affect aquatic habitat in the tailwater and sport fishing.

The outdraft condition is present approximately 50 percent of the time during the navigation season. Temporary dam gate closure would be effective only during times when river discharge is between 21,000 cfs and 25,000 cfs, a small percentage of the time.

The operation of partially closing gates to reduce the outdraft condition at Lock and Dam 3 creates many concerns. Of greatest concern is the likelihood of significant flow passing over the spot dikes and the intermediate and lower Wisconsin embankments without a high tailwater condition. Even one operation where the gates become stuck in a partially closed position could cause a tremendous amount of erosion.

Although the cost of making dam gate changes is relatively low, we did not estimate the cost of this alternative measure because it was not retained for further consideration for technical reasons.

Retain for further consideration? No, for technical reasons.

5.1.1.2 Hydraulic Modifications

NH1– Bendway Weirs or Iowa Vanes

Bendway weirs are rock structures built on the riverbed at an angle to the flow to deflect current away from the bank. Iowa vanes operate the same way, but they are smaller in scale and made out of cast concrete. These measures were considered to reduce the outdraft current in the lock approach. Their effects were modeled using physical and numerical hydraulic models (Hydraulics Appendix H). Bendway weirs could reduce the outdraft current, but they would have to be located in the immediate lock approach. Towboat pilots found this measure unacceptable because turbulence over bendway weirs would make aligning the tow to enter the lock more difficult.

Although the cost of building bendway weirs is relatively low, we did not estimate the cost of this alternative measure because it was not retained for further consideration for technical reasons.

Retain for further consideration? No, for technical reasons. Bendway weirs would unacceptably interfere with navigation.

NH2A – Additional Wing Dams
NH2B – Remove Wing Dams

Wing dams are rock structures extending from the riverbank toward the main channel to concentrate flow in the main channel. A variety of configurations with wing dams were considered but were found to be ineffective in reducing the outdraft condition or were found to interfere with navigation.

Constructing wing dams is relatively inexpensive. Because this alternative measure was not retained for technical reasons, we did not prepare an initial construction cost estimate.

Retain for further consideration? No, for technical reasons. Constructing new wing dams or removing existing wing dams would not reduce the outdraft problem.

NH3 – Excavate Main Channel

The upstream approach to the gated part of the dam would be dredged to deepen it and convey more flow, diverting flow away from the Minnesota side of the river and reducing the outdraft current. This alternative was modeled and found not to reduce the outdraft current significantly as a stand-alone measure (Hydraulics Appendix H). Dredging the main channel in combination with filling in the lock approach was found through model simulations to reduce the outdraft condition.

The cost of channel excavation is relatively inexpensive, depending on the volume of material to be excavated and where the material is to be placed. Because we did not retain this alternative measure as a stand-alone alternative, we did not prepare an initial cost estimate.

Retain for further consideration? Yes, not as a stand-alone measure, but combined with other alternative measures.

NH4 – Additional Dam Gates

Additional piers and dam gates would be constructed to convey more flow, reduce the outdraft problem and reduce the potential for loss of water control and overtopping of the Wisconsin embankments during navigation accidents. Because the lock is located on the outside of a bend in the river, adding dam gates would probably not be a solution to the outdraft problem.

The construction footprint of new piers, dam gates, and approach and exit channels would be large and would have adverse environmental effects.

Cost of constructing new dam piers and gates would be high, probably more than $50,00,000. Because this alternative measure was rejected for technical reasons, we did not prepare an initial construction cost estimate.

Retain for further consideration? No, for technical reasons. This alternative measure would not reduce the outdraft current, and it would be disruptive to the river environment.

NH5 – Additional Spillways

Additional spillways would be constructed on the Wisconsin and Minnesota sides of the dam to convey more flow during higher levels of river discharge and reduce the potential for loss of water control and overtopping and failure of the Wisconsin embankments during navigation accidents.

With spillways on both sides of the river, the construction footprint would be large and would have adverse environmental effects. On the Minnesota side, much excavation would have to be done through contaminated backwater sediment. Large areas of floodplain forest would be affected on the Minnesota side to excavate a bypass channel and to construct a spillway. A road bridge would be needed to cross the bypass channel to maintain access to Lock and Dam 3.

Constructing additional spillways on both the Minnesota and Wisconsin sides of the river would be expensive, with construction costs of probably more than $50,000,000. Because this alternative measure was rejected for technical reasons, we did not prepare an initial construction cost estimate.

Retain for further consideration? Yes, but only spillways on the Wisconsin side and in combination with other measures.

5.1.1.3 Barrier Alternatives

NB1– Rock Jetty

A 1,250-foot-long rock jetty was recommended in 1988 (Corps of Engineers 1988), and a 1,340-foot-long rock jetty was recommended in 1990 (Corps of Engineers 1990). Both proposed projects included excavation of 260,000 cy of material from the main channel with placement of the material on Prairie Island. A rock jetty would be constructed extending upstream from the intermediate lock wall to form a quiet water zone in the lock approach.

The rock jetty alternative would require dredging 260,000 cy of material from the main channel in the approach to the gated part of the dam. Concern was raised about groundwater contamination in the proposed upland dredged material placement site . Further modeling of this alternative measure revealed that a significant outdraft current would occur across the upstream end of the jetty (Hydraulics Appendix H). Ice and debris would also be a problem. Some towboat pilots consulted thought that a rock jetty would present another dangerous obstacle in the river.

The rock jetty and channel excavation proposed in 1990 would cost approximately $9,602,000 to construct.

A rock jetty would impose navigation safety problems with recreational boaters in keeping boaters out of the immediate lock approach and with reduced opportunity for rescue operations.

Retain for further consideration? No, for technical reasons.

NB2 – Cell-Type Guard Wall

A 1,230-foot-long ported guard wall was proposed in 1995 as a navigation safety improvement project at Lock and Dam 3 (Corps of Engineers 1995a). A guard wall would be constructed of sheet pile cells extending upstream from the intermediate lock wall (Figure 5-1). The guard wall would be a series of filled steel sheet pile cells or caissons with a rubbing wall along the lock side. Water would flow between the cells below the rubbing wall. A gated gap between the guard wall and the intermediate lock wall would provide for exit of ice and debris from the lock approach. The right descending bank would be excavated and armored with riprap to provide room to maneuver in the upper lock approach.

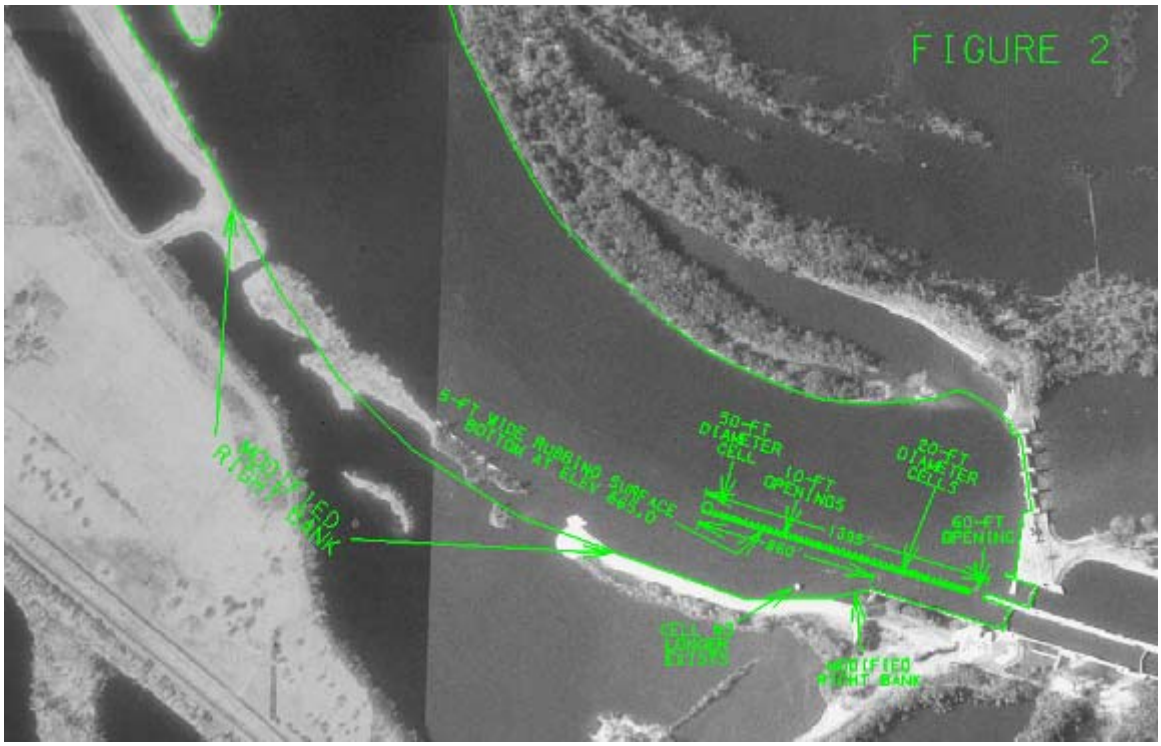


Figure 5-1. Alternative measure NB2 Ported guard wall.

This alternative measure would cost $16,587,000 for construction based on the estimate from the 1995 report adjusted to January 2006 price levels. The cost estimate has not been updated because this alternative has been eliminated from further consideration (see Section 5.1.1.5 below).

A guard wall could reduce the risk of navigation accidents and the potential for overtopping the Wisconsin embankments. Constructing a guard wall in deep water would be challenging and would take more than a year to complete. Construction could interfere with navigation.

A guard wall would impose difficulties for towboat pilots and for lock operators. Flow through ports between the cells would move down bound tows toward the guard wall. Towboat pilots would have to maneuver the tows from the intermediate lock wall to the landward "working" wall side of the lock as they were entering.

Some towboat pilots consulted did not like the guard wall, citing difficulties in entering the lock and concern about another obstacle in the river.

A guard wall would impose navigation safety problems with recreational boaters in keeping boaters out of the immediate lock approach and with reduced opportunity for rescue operations.

The guard wall could also create problems with ice and debris that would add significant additional costs for construction and operations and maintenance.

Retain for further consideration? Yes

NB3 – Rock Mounds or NB4 Cells to Protect Dam

Rock mounds, steel sheet pile cells or possibly mono-piles (large driven pilings) would be constructed immediately upstream of the dam gates to block towboats and barges from colliding with the gated part of the dam and breaking up on the piers between the dam gates. Although relatively low cost, constructing the rock mounds or cells would not prevent collisions with the dam and would not improve navigability. Rock mounds, sheet pile cells or mono-piles in front of the dam gates could interfere with recovery of tows caught in the outdraft current. Rock mounds or cells would block part of the river cross section and could unacceptably raise water levels upstream of the dam.

Although construction cost of cells or rock mounds to protect the dam would be relatively low, we did not prepare an initial cost estimate because this alternative measure was not retained for technical reasons.

Retain for further consideration? No, for technical reasons.

NB5 – Cable Across Dam

A cable across the dam would be installed to block towboats and barges from colliding with the gated part of the dam. A barrier cable would be difficult to engineer to cope with the fluctuating water levels, the raked bow of barges, and the enormous weight and momentum of loaded tows. A barrier cable might not be effective in preventing collisions with the dam and would not improve navigability.

We did not prepare a cost estimate for this alternative measure because it was not retained for technical reasons.

Retain for further consideration? No

NB6 – Guide Cable Upstream of Lock

A guide cable would be installed extending from the intermediate lock wall upstream, to guide tows into the lock. Such a guide cable system could not be designed to be effective.

We did not prepare a cost estimate for this alternative measure because it was not retained for technical reasons.

Retain for further consideration? No

5.1.1.4 Other Alternative Measures

NO1 Extend Upper Guide Wall

The upper guide wall would be extended 862 feet upstream to provide a longer wall for tows to land against and get a line onto shore, enabling maneuvering the head of the tow into alignment to enter the lock chamber. This alternative measure would work well in combination with channel modifications (Hydraulics Appendix H).

The cost of constructing a 962-foot extended guide wall would be $16,020,000 (Cost Engineering Appendix L).

Retain for further consideration? Yes, in combination with channel modifications, based on hydraulic modeling (Hydraulics Appendix H).

NO2 Extend Upper Intermediate Lock Wall

The upper intermediate lock wall would be extended upstream (in concept, to an unspecified length) to provide a protected zone for towboats to enter the lock. This alternative would require excavating along the right (Minnesota) bank to make room for tows to maneuver. Ports through the extended intermediate wall would be needed to allow water flow through the wall and reduce an outdraft current at the upstream end of the wall. Tow boat operators might find it difficult to get between two walls 110 feet apart at a bend in the river.

In concept, this alternative would function much like a rock jetty (alternative NB1 above), but it would be much more costly to construct. Ice and debris would be a problem. An extended intermediate lock wall would impose navigation safety problems to recreational boaters in keeping boaters out of the immediate lock approach.

We did not prepare an initial cost estimate for this alternative measure because it was not retained for technical reasons.

Retain for further consideration? No, for technical reasons.

NO3 Enlarge Lake Opening

Prior to modifying the Minnesota riverbank immediately upstream of the existing guide wall at Lock and Dam 3 and constructing a loading dock, an outlet of a backwater lake produced some localized outdraft current that interfered with tows entering the lock. Also, Xcel Energy modified the discharge system at the Prairie Island Nuclear Power Plant, reducing flow through the backwater lake adjacent to Lock and Dam 3. These modifications have eliminated the navigation problem with the lake opening.

Retain for further consideration? No, for technical reasons.

5.1.1.5 Additional Hydraulic Analyses and Alternative Measures

Two-dimensional hydrodynamic modeling was used to investigate the hydraulics of the remaining structural alternatives. Variations on the remaining structural alternatives were also investigated as the modeling effort progressed. The 2-D modeling effort involved testing 38 different conditions with a river discharge of 36,000 cfs. The 36,000-cfs discharge was chosen because the outdraft current is strongest for discharges near this bank-full flow condition. Details of these simulations are provided in Hydraulics Appendix H.

The outdraft problem at Lock and Dam 3 has no easy solution. Hydraulic, structural, cost, constructability, operational, environmental, and maintenance issues all have to be addressed in identifying the best alternative measure. As a result of the two-dimensional numerical modeling effort and the other past studies, four structural navigation improvement alternatives were recommended for further investigation.

Additional three-dimensional hydrodynamic modeling was used to investigate the hydraulics of the structural navigation improvement alternatives.

A meeting of PDT members, towing industry representatives, and nine towboat pilots was held at the St. Louis District office on January 30, 2002, to review alternatives for improving navigation safety at Lock and Dam 3. Previous hydraulic studies, alternatives considered, and the results of the three-dimensional modeling effort were discussed. The representatives stated that building an extended guide wall would be better than doing nothing, but unanimously agreed that a 1,400-foot-long ported guard wall is the preferred alternative for improving navigation safety at Lock and Dam 3. A memo summarizing the meeting is attached as Exhibit A in Hydraulics Appendix H.

With all but six navigation safety alternative measures eliminated, the remaining alternatives were given new short titles. Navigation safety alternatives NN1, NN2, NN3, and NN4 (described previously) were renamed alternatives N1, N2, N3, and N4. The other two remaining alternatives, the guard wall (previously labeled NB2) and the extended guide wall with channel modifications (a combination previously labeled NO1 and NH3) were named alternatives N5 and N6, respectively.

Concurrent with the hydraulic engineering efforts to determine the best navigation safety alternative, the PDT was working to assess the environmental, constructability, operability, maintenance, and safety issues for the remaining alternatives. While N5 was found to be the best alternative hydraulically, PDT members expressed concerns related to these other issues.

Environmental Issues:

- Excavation of the right bank would disturb contaminated sediment.

Constructability Issues:

- Deep-water construction in flowing water.
- Limited construction season or construction with navigation occurring.
- Protecting a partly constructed structure from navigation.

Operability/Maintenance Issues:

- The guard wall might need to become the working wall.
- Ice and debris would be trapped by the guard wall.
- Barges would rub along the guard wall as a result of the crossing flow; high maintenance of rubbing surfaced.

Safety Issues:

- Even though flow conditions would be good, the wall would be out in the middle of the river and could be hit.
- The guard wall would complicate interaction of commercial and recreational traffic.
- Recreational boats might be difficult to keep out of the area between the guard wall and the Minnesota bank, interfering with up bound vessels leaving the lock.
- Reaction time to a vessel in trouble upstream of the dam would be longer because of the presence of the guard wall; the wall would be a visual and physical barrier to rescue personnel.

Because of these concerns, the PDT chose the extended guide wall with channel modifications (N6), not the guard wall (N5), as the preferred navigation safety alternative. Another meeting with the towing industry was scheduled to discuss the PDT's reasons for selecting N6 and to make sure that the industry would support N6. PDT members, towing industry representatives, and two towboat pilots met in Rochester, Minnesota, on January 16, 2003. The towing industry representatives and pilots stated that they felt a 1,400-foot-long guide wall would provide better conditions at Lock and Dam 3 and urged the Corps to move forward. A memo summarizing the meeting is attached as Exhibit B in Hydraulics Appendix H.

N6 – Extended Guide Wall with Channel Modifications

Hydraulic model simulations revealed that a combination of an extended guide wall and channel modifications was a promising alternative to improve navigation safety at Lock and Dam 3 (Hydraulics Appendix H) (Figure 5-2).

The channel improvements would consist of dredging and filling in the channel to relocate the thalweg. The length of the dredge cut in the center of the channel was determined by the amount of fill required to fill the existing thalweg and construct the guide wall. The dredge cut elevation is 650.0 feet msl. Project pool level is 675.0 feet msl. The existing thalweg in the lock approach area would be filled with dredged material and capped with riprap to an elevation of 655.0 feet msl. The lock approach would have a water depth of 20 feet. The riprap cap in this area would have 24-inch-diameter rock, with scattered 36-inch-diameter rocks to provide habitat for fish.

The existing concrete landward guide wall would be extended 862 feet to provide a long enough guide wall for the full length of a six-barge-long tow and towboat to land against and to tie off with lines if needed. With only a 600-foot-long lock chamber, tow haulage units are used

at Lock and Dam 3, mainly to pull the first cut of an up bound tow out of the lock chamber onto the guide wall. The tow haulage units in the St. Paul District are basically a fixed winch on the land side (working) wall that pulls the cuts of barges out of the lock chamber with a steel cable. None of the locks in the St. Paul District have a “moving haulage or kevel unit.” The extended guide wall would not include a tow haulage unit.

A pile-supported concrete guide wall extension would be constructed with a continuous concrete rubbing surface (Structures Appendix I). The bottom of the concrete would be at the river surface elevation to allow the wall to be constructed almost entirely from above the water surface.

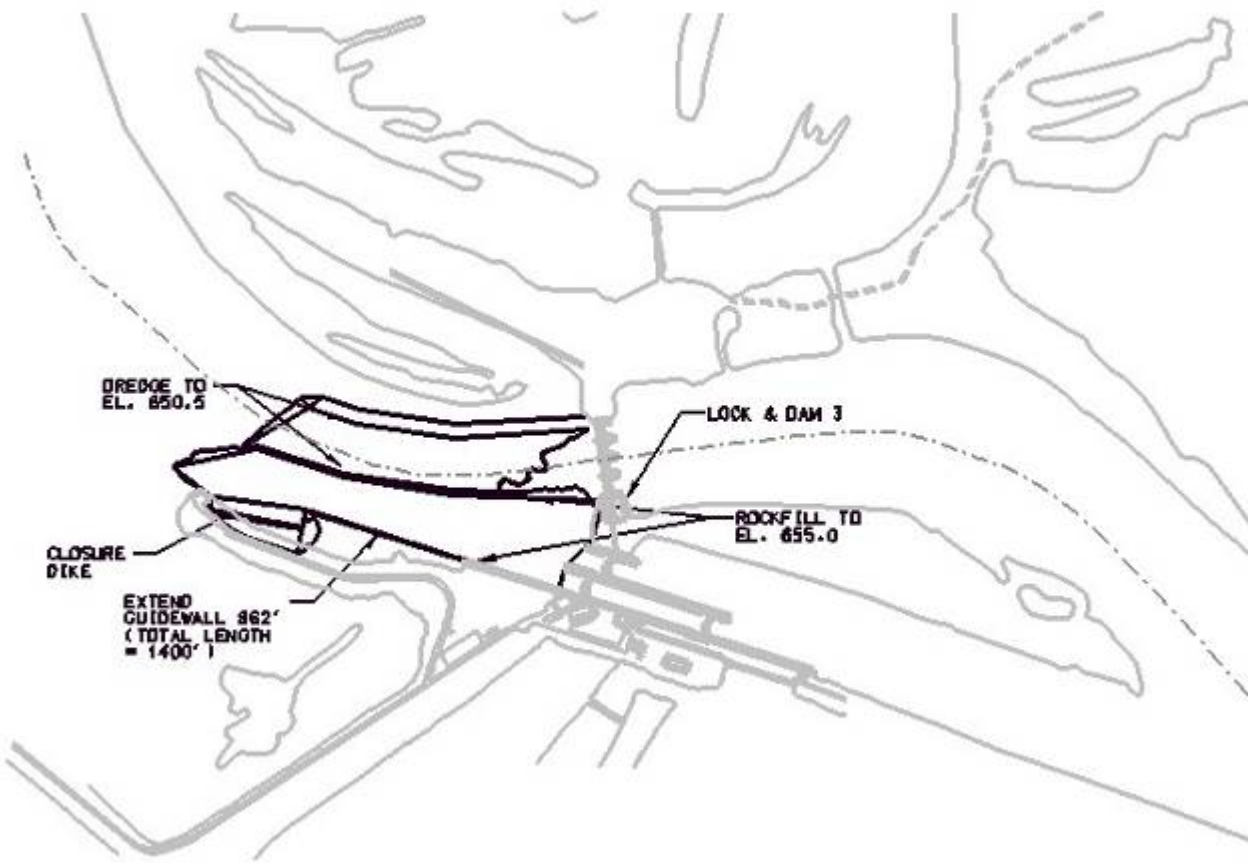


Figure 5-2. Alternative measure N6 extended guide wall with channel modifications.

This alternative measure would cost $30,227,000 for construction and $247,000 for annual operation and maintenance. This alternative measure is more expensive than the NB2 cell-type guard wall alternative primarily because of the driven steel pilings and the dredging and rock placement. This comparison is based on an old cost estimate for the guard wall. An updated cost estimate for a guard wall would be higher.

An extended guide wall with channel modifications would reduce the risk of navigation accidents. A guide wall would not impose significant operation and maintenance problems or problems with recreational boating safety. Construction could be conducted without restricting or delaying navigation. The towing industry supports this alternative measure to improve

navigation safety. Channel modifications would alter aquatic habitat conditions but not unacceptably.

Retain for further consideration? Yes

5.1.2 Embankments Alternative Measures

A list of 22 alternative measures for improving the Wisconsin embankments was developed after reviewing the previous studies and obtaining input from stakeholders. The alternatives considered are listed in Table 5-2.

Table 5-2. Alternative measures for improving the Wisconsin embankments at Lock and Dam 3.

Nonstructural measures	
EN1	No action - make repairs as necessary
EN2	Enable routine maintenance of embankments
EN3	Enable rapid embankment repairs
EN4	Regulate Pool 3 on low side during routine operation
EN5	Regulate Pool 4 on high side during routine operation
EN6	No-wake zone along lower embankment
Structural measures	
ES1	Strengthen existing overflow sections and selected embankment sections
ES2	Reconstruct upper embankment
ES3	Reconstruct middle embankment
ES4	Reconstruct lower embankment
ES5	Additional spillway (Minnesota side)
ES6	Reduce outdraft current
ES7	Lower Prairie Island Nuclear Power Plant cooling water intake
ES8	Additional dam gates
ES9	Armor lower embankment
ES10	Increase flow through existing gates
ES11	Partial closure between tip of peninsula across to left bank upstream of dam.
ES12	Tailwater constrictions to raise tailwater
ES13	Add wing dams on left bank upstream of dam
ES14	Add bendway weirs on left bank upstream of dam
ES15	Armor lower embankment on landward side
ES16	Add designed failure points

Representatives of the St. Paul District Corps of Engineers, the USFWS, MnDNR, MPCA, WDNR, Minnesota-Wisconsin Boundary Area Commission, Upper Mississippi Waterways Association, Sierra Club, and Diamond Bluff Associates attended an extended planning team meeting in St. Paul on December 6, 2000, to review the alternative measures.

After discussing all alternatives, the extended planning team agreed that alternatives EN4, EN5, ES7, ES8, ES10, ES11, ES12, ES13, ES14, ES15, and ES16 could be dismissed without further analyses. Following the extended planning team meeting, a review of the cost estimates for ES2, ES3, and ES4 led to dismissing ES2 and ES3. Alternative ES6 was being addressed on the navigation safety side of the project so it was dropped as a separate embankments alternative. A discussion of these considerations follows.

5.1.2.1 Nonstructural Measures

EN1 – No Action

No additional action would be taken to improve the Wisconsin embankments. Maintenance and repairs would continue as needed. Repairs have averaged about $16,000 per year since 1964 (Table 3-2), in addition to the cost of annual mowing and brushing every few years. Annual cost of repairs and maintenance in the future without-project condition would be approximately $26,000. Continued patchwork repairs would not prevent failure of the embankments given the many mechanisms and locations where embankment failure could occur.

The embankments have a high probability for failure within the next 50-year planning period (see the future without-project section 3.2.3 above). Failure of the lower embankment could result in a scour channel through the Gantenbein Lakes area bypassing Lock and Dam 3, leading to an accidental drawdown of Pool 3 with significant adverse ecological and economic consequences.

Failure of the upper embankment would flood Marsh and Gantenbein Lakes to the level of Pool 3, elevation 975.0 feet msl. After flooding, Marsh Lake and Gantenbein Lake would be 1 foot and 2 feet deeper, respectively, with significant adverse effects on the marsh and surrounding floodplain forest habitat and wildlife.

This alternative measure would include no cost to strengthen the Wisconsin embankments.

Stakeholders want to have the embankment system strengthened. This alternative measure would be unacceptable. It would not meet the planning objectives for this project.

Retain for further consideration? Yes. The no-action alternative will not be used in formulation of alternative plans (e.g., no action on embankments combined with navigation safety improvements). Combination navigation safety improvement and embankments plans are needed to meet the planning objectives for both navigation safety and embankments improvements. Stand-alone navigation safety improvement and stand-alone embankments strengthening measures would not acceptably reduce risk of the related problems. The no action embankments alternative will be used (in combination with no action on navigation improvements) as the without-project future baseline condition for evaluating the alternative plans.

EN2 – Enable Routine Maintenance

This alternative measure would enable more routine maintenance of the embankments. Access to the embankment areas would be improved to allow more thorough inspections. This

measure would have low effectiveness in preventing embankment failure through continued patchwork repairs.

Retain for further consideration? Yes. This alternative will be incorporated into the alternative plans.

EN3 – Enable Rapid Repairs

This alternative would enable expedited repairs. Access to the embankment areas would be improved to allow more rapid mobilization of materials and equipment. Material would be stockpiled and access permissions obtained in advance to enable more rapid repairs.

Retain for further consideration? Yes. This alternative measure will be incorporated into the alternative plans.

EN4 – Modify Pool Regulation – Operate on Low Side
EN5 – Modify Pool Regulation – Operate on High Side

Stakeholders suggested regulating Pool 3 on the low side during routine operation, which would theoretically reduce the frequency of overtopping the embankments. Another suggestion was to regulate Pool 4 on the high side during routine operation, which would theoretically reduce the head across the dam and potential for erosion when the embankments are overtopped.

This alternative has low feasibility. Modified regulation of Pool 3 is possible, but it would not have much effect on the frequency and duration of overtopping the embankments and potential for embankment failure. Lower Pool 3 water levels would increase dredging requirements to maintain the navigation channel. Regulation of Pool 4 on the high side to reduce head at Lock and Dam 3 is not possible. Water levels below Lock and Dam 3 are controlled by river discharge not by operation of Lock and Dam 4, except at extremely low levels of river discharge.

Retain for further consideration? No, for technical reasons.

EN6 – No-Wake Zone

Restricting recreational boat speed and wake wave height in the tailwater below Lock and Dam 3 would help reduce the rate of bank erosion along the lower embankment, especially during higher levels of river discharge. Given the deteriorated condition of the lower embankment and the need to strengthen it, reducing wake wave action alone is not a solution. Regulation of recreational boating traffic is a responsibility of local units of government. The Corps of Engineers does not have the authority to impose wake wave restrictions on recreational boaters except in close proximity to locks and dams.

Retain for further consideration? No, for technical and authority reasons.

5.1.2.2 Structural Measures

ES1 – Strengthen Overflow Sections and Selected Embankment Sections

This alternative would include selective reconstruction of spot dikes and deteriorated areas in the other embankments. This measure would not be sufficient to significantly reduce the risk of embankment failure. Strengthening only selected parts of the embankments system would leave the other segments more prone to scour and failure.

We did not prepare an initial cost estimate for constructing this alternative measure because it was not retained for technical reasons.

Retain for further consideration? No, for technical reasons.

ES2 - Reconstruct Upper Embankment

This alternative would reconstruct the spot dikes in the upper embankment. This measure alone would not be sufficient to prevent failure of the lower and intermediate embankments.

The cost of rebuilding the spot dikes was estimated to be $3,924,000.

Retain for further consideration? Yes. It will not be retained as a stand-alone measure but will be incorporated into alternative plans.

ES3 – Reconstruct Intermediate Embankment

An embankment project was proposed in 1995 (Corps of Engineers 1995a) that would have reconstructed the intermediate embankment. The estimated construction cost was $10,535,000. A subsequent value engineering study and additional borings revealed that soil conditions under the intermediate embankment would make the embankment system vulnerable to scour if the lower embankment failed. Considerable additional excavation of weak soils would have significantly raised the cost of this alternative measure; reconstruction of the lower embankment was proposed in 1999.

Retain for further consideration? No, for technical reasons.

ES4 – Reconstruct Lower Embankment

The embankment project proposed in 1999 was to construct an embankment starting from the dam, extending along the tailwater generally following the shoreline and around the south end of Gantenbein Lake, turning east and linking up to high ground. The proposed project features included a sheet pile reinforced earthen embankment with a 1,500-foot-long roller-compacted concrete spillway between Gantenbein Lake and the river with a crest elevation of 675.0 feet msl. Gated water control structures were proposed for Marsh and Gantenbein Lakes.

The estimated construction cost for this project was $11,000,000, adjusted to January 2006 price levels.

Without reconstructing the spot dikes in the upper embankment and maintaining that part of the embankment system, this alternative measure would leave the upper embankment vulnerable to failure, resulting in the flooding of Marsh and Gantenbein Lakes to the Pool 3 water level of 675.0 feet msl, with adverse environmental consequences. The project would have adversely affected a species-rich mussel bed in the tailwater and would have had a large construction footprint through a floodplain forest wetland area.

Retain for further consideration? Yes, with modifications to avoid mussels in the tailwater and modified spillway design.

ES5 – Additional Spillway on Minnesota Side of River

Stakeholders suggested adding a spillway on the Minnesota side of the river. This alternative would involve excavating a large channel and a fixed crest spillway to convey water around the Minnesota side of Lock and Dam 3. Although diverting water around Lock and Dam 3 could potentially reduce flow through the Wisconsin embankments, excavating a diversion channel and constructing a bridge and spillway would be an expensive project. A spillway project on the Minnesota side of the river would have adverse environmental effects on the existing backwater and Vermillion River floodplain forest.

We did not prepare an initial cost estimate of this alternative measure because we did not retain it for technical reasons.

Retain for further consideration? No, for technical reasons.

ES6 – Reduce Outdraft Current

Stakeholders suggested this embankments alternative measure. Reducing the outdraft current would reduce the risk of navigation accidents and subsequent embankment failure.

We recognized the need to address both navigation safety and the embankment problems at Lock and Dam 3. Reducing the outdraft current alone would not prevent failure of the embankments. The embankments are very likely to fail in the near future regardless of what is done to improve navigation safety.

Retain for further consideration? Yes. A number of navigation safety improvement alternatives to reduce the outdraft current were considered in detail.

ES7 – Modify Power Plant Intake

Stakeholders suggested modifying the intake on the Prairie Island Nuclear Power Plant to reduce the consequences of an accidental drawdown of Pool 3.

Modifying the cooling water intake at the Prairie Island Nuclear Power Plant would have very high costs, probably in excess of $100 million given the large size and complexity of the circulating water pumps and screen house (Terry Coss, Xcel Energy, personal communication 2005). The cooling water intake, circulating water pump and traveling screen system would have to be redesigned and reconstructed to a lower elevation. In addition, the intake and cooling water system at the Allen S. King Generating Plant on the St. Croix River would have to be lowered as well.

This alternative would not reduce the potential for navigation accidents or do anything to improve the integrity of the embankments.

We did not prepare an initial cost estimate for this alternative measure because of the indication of high cost from Xcel Energy and for technical reasons.

Retain for further consideration? No, for technical and cost reasons.

ES8 – Additional Dam Gates

Stakeholders suggested constructing additional dam gates at Lock and Dam 3 to convey flow that is presently going over the Wisconsin embankments during periods of higher river discharge. The construction footprint of new piers, dam gates, and approach and exit channels would be large and would have adverse environmental effects. Additional dam gates on the Wisconsin side of the river would require excavation through the Marsh Lake area and realignment of the lower embankment, with adverse environmental effects.

Cost of constructing additional dam piers and gates would be high, probably greater than $50,000,000. Because this alternative measure was rejected for technical reasons, we did not prepare an initial construction cost estimate.

Retain for further consideration? No, for technical reasons.

ES9 – Armor Lower Embankment

This alternative would replace rock riprap along the lower embankment that has eroded. It would not significantly reduce the potential for embankment failure resulting from the lack of protection from erosion caused by water flowing over the embankment, but it would temporarily stabilize the riverbank along the tailwater. Riprap placement along the lower embankment could adversely affect mussels in the tailwater.

Because this alternative measure was rejected for technical reasons, we did not prepare an initial construction cost estimate.

Retain for further consideration? No, for technical reasons.

ES10 – Increase Flow Through Dam

Stakeholders suggested increasing flow through the dam gates to reduce the frequency and duration of overtopping the embankments. The only way to increase flow through the

existing gates is to increase the water level in Pool 3. This would increase, not decrease, the potential for embankment failure.

Retain for further consideration? No, for technical reasons.

ES11 – Partial Closure

Stakeholders suggested construction of a closing embankment between the peninsula and the existing embankment on the Wisconsin side immediately upstream of the dam (see Figure 3-6). The bay between the peninsula and the dam has mostly filled in, and the entrance is now very shallow. A partial closure between the upstream embankment and the peninsula immediately upstream of the dam would not significantly affect the potential for embankment failure.

Retain for further consideration? No, for technical reasons.

ES12 – Tailwater Constrictions

Stakeholders suggested that a series of emergent wing dams or weirs could theoretically increase tailwater elevation and reduce the head differential across the embankment system, thereby reducing the potential for embankment failure during overtopping events.

This measure is impracticable. Higher water levels in the tailwater would keep the lower embankment soils saturated and vulnerable to erosion for a longer period of time than presently occurs. Increased frequency of higher stages in the tailwater would impose boat wake wave bank erosion at higher elevations along the lower embankment, accelerating erosion along the lower embankment. A sill or set of emergent wing dams accelerating water over or through the structures could pose serious navigation hazards for the many recreational boaters using the tailwater. Modifying the geometry and hydraulic conditions in the tailwater could adversely affect the many fish species using the tailwater and the economically important sport fishery. Impounding water in the tailwater would impose higher water levels in the Gantenbein Lakes and Cannon River Bottoms areas, with adverse effects on floodplain forest wetlands.

Retain for further consideration? No, for technical reasons.

ES13 – Add Wing Dams on Left Bank Upstream of Dam
ES14 – Add Bendway Weirs on Left Bank Upstream of Dam

Stakeholders suggested adding wing dams or bendway weirs on the left descending bank upstream of Lock and Dam 3 to deflect flow away from the spot dikes and reduce erosion. This measure would not work hydraulically and could exacerbate the outdraft problem.

Because this alternative measure was rejected for technical reasons, we did not prepare an initial construction cost estimate.

Retain for further consideration? No, for technical reasons.

ES 15 – Armor Lower Embankment on Landward Side

Stakeholders suggested armoring the lower embankment on the landward side to protect against embankment failure during overtopping events while avoiding construction on the river side and disturbing mussels in the tailwater. This alternative measure would not work hydraulically because the embankment would continue to be eroded from the river side, leading to embankment failure.

Because this alternative measure was rejected for technical reasons, we did not prepare an initial construction cost estimate.

Retain for further consideration? No, for technical reasons.

ES16 – Embankment Failure Points

Stakeholders suggested constructing "fuse plug" type failure points in the embankments, which would concentrate erosion failure to selected sites in the embankments system and enable rapid repairs.

This measure would not be feasible from an engineering perspective. Much of the length of the embankments is low natural ground. It would not be practicable to construct failure points, given the many places along the embankments where scour channels can develop.

Because this alternative measure was rejected for technical reasons, we did not prepare an initial construction cost estimate.

Retain for further consideration? No, for technical reasons.

5.1.2.3 Refinement of Embankment Alternative Measures

Following initial evaluation of the embankment alternative measures, the Corps PDT and stakeholders, recognizing the need to have a more secure embankment system, combined some of the more promising alternative measures. A modified alternative measure for reconstructing the lower embankment was developed, shifting the embankment alignment and using launchable rock riprap to avoid mussels in the tailwater. Following a site visit and discussion, the WDNR, MnDNR, and USFWS proposed an additional embankment alternative that would minimize construction impacts. Upon further examination, the Corps PDT identified another embankment alternative that would limit construction impacts and strengthen the embankment system with phased construction by initially reconstructing them to Corps design standards only in areas that have significant risk of failure and completing construction of the lower embankment later if necessary. The result was a second set of embankment alternative measures that were defined and examined in greater detail. The labels for the measures that were used by the Corps PDT and stakeholders during that planning effort have been retained.

Improved access, routine inspections, maintenance and capability for rapid repairs are part of all the embankment alternatives. These measures would include annual inspections, inspections after overtopping events, improved physical access, real estate rights for access, and material available to facilitate rapid repairs.

Table 5-3 Refined Set of Alternative Measures to Strengthen the Wisconsin Embankments at Lock and Dam 3.

E2	Strengthen embankments
E3	Reconstruct lower embankment
E4	States and USFWS proposal
E5	Reconstruct embankments with phased construction

E2 – Strengthen Embankments

This measure would strengthen the existing embankments without reconstructing them to Corps design standards for the entire project length (Figure 5-3).

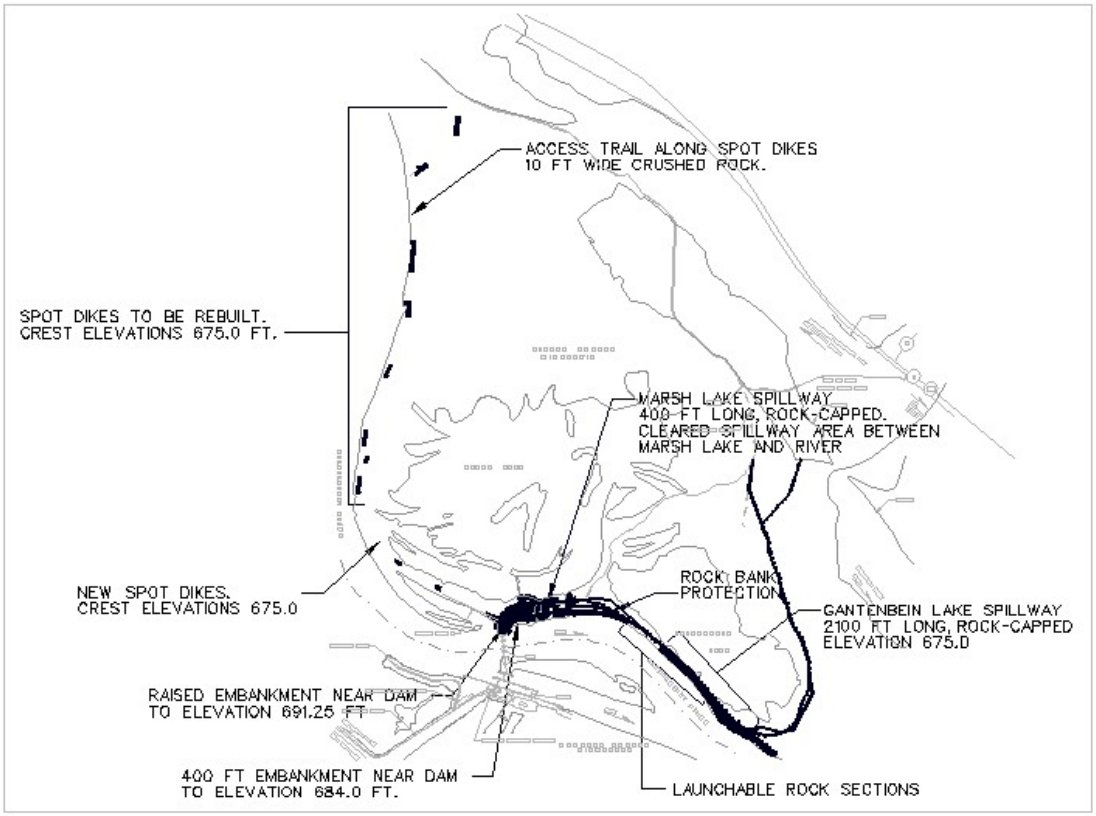


Figure 5-3. Alternative measure E2 strengthen embankments.

The spot dikes in the upper embankment would be rebuilt. New sheet pile would be driven at the spot dikes, offset about 15 feet from the old sheet pile. The sheet pile would extend downward 30 feet to elevation 645 feet msl to withstand scour that would occur if the lower embankment failed. Rock riprap in the overflow channels of the spot dikes would be placed and keyed into the surrounding grade. Low areas that have scour along the upper embankment would be filled. One or two additional spot dikes would be constructed in larger existing scour channels, and a 10-foot-wide access trail of crushed rock along the upper embankment would be constructed.

A 400-foot-long area near the dam would be raised. All project features within 800 feet of Lock and Dam 3 would be constructed to Corps design standards. A 400-foot-long Marsh Lake spillway would be constructed. The old Marsh Lake water control structures would be replaced.

The lower embankment shoreline would be reshaped and armored with riprap. The riprap would have launchable rock sections to limit the riverward footprint of work to protect the mussel bed in the tailwater area. A 2,100-foot-long rock-capped Gantenbein Lake spillway would be constructed.

This alternative would cost $21,452,000 for construction and environmental mitigation. Annual operation and maintenance costs would be $176,000.

Although the entire length of this alternative would not be up to Corps standards, it would reduce the risk of embankment failure. Construction would have a medium environmental impact primarily from the loss of trees and floodplain habitat along the lower embankment. Reconstruction of the upper embankment spot dikes would prevent failure of the upper embankment and scour and flooding damage to Marsh and Gantenbein Lakes. The lower embankment alignment around the south end of Gantenbein Lake would remain unprotected, probably requiring further repairs and construction of a low embankment or spillway sometime in the future.

The launchable rock riprap along the lower embankment might not work as intended and might slide riverward or be undermined. In the first case, rock would spill over the mussel bed in the tailwater. In the second case, the riprap section and the adjoining natural ground could fail, resulting in a scour channel migrating upstream, damaging Gantenbein and Marsh Lakes and threatening the upper embankment.

Retain for further consideration? Yes.

E3 – Reconstruct Lower Embankment

This alternative measure is similar to the 1999 proposal to reconstruct the lower embankment, but with modifications of its alignment to avoid mussels in the tailwater. This alternative measure would reconstruct the entire lower embankment to a design that would minimize the risk of system failure (Figure 5-4). The spot dikes in the upper embankment would not be rebuilt, but would be repaired as necessary. An 800-foot-long area near the dam would be raised. All project features within 800 feet of Lock and Dam 3 would be constructed to Corps design standards. A 400-foot-long Marsh Lake spillway would be constructed, along with a 2,200-foot-long Gantenbein Lake spillway. The old Marsh Lake water control structure would be replaced, and a new outlet structure would be constructed at Gantenbein Lake. The riverward side of the Marsh Lake and Gantenbein Lake spillways would be armored with rock riprap and launchable rock to protect against scour, while limiting encroachment on the mussel bed in the tailwater. A raised lower embankment would extend from the river to high ground at the base of the Wisconsin bluff.

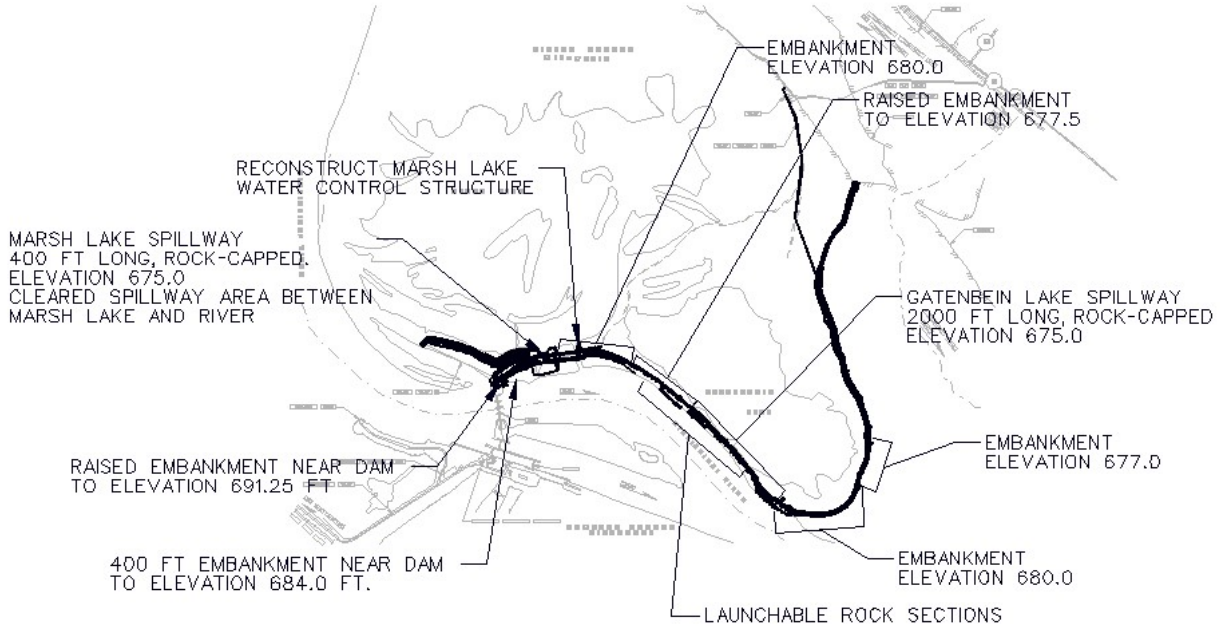


Figure 5-4. Alternative measure E3 reconstruct lower embankment.

This alternative measure would cost $21,844,000 for construction and environmental mitigation and $176,000 for annual operations and maintenance. The costs are based on a 2001 estimate adjusted to January 2006 price levels. They have not been updated because this alternative has been eliminated from further consideration for technical reasons.

Although this alternative would provide a more secure embankment system, it would not meet the project objective of protecting the river environment. This alternative would leave Marsh and Gantenbein Lakes vulnerable to flooding through failure of the upper embankment. Failure of the upper embankment would flood Marsh and Gantenbein Lakes to the level of Pool 3 at elevation 975.0 feet msl, causing significant damage to the wetland and floodplain forest habitat in that area.

The E3 embankments alternative would result in a relatively large construction footprint along the whole length of the lower embankment through floodplain forest wetlands. The rock riprap and rock riprap topped spillways would limit movement of amphibians and turtles between the river and the Gantenbein Lakes. The launchable rock riprap along the lower embankment might not work as intended and might slide riverward. In the first case, rock would spill over the mussel bed in the tailwater. In the second case, the riprap section and the adjoining embankment could fail, resulting in a scour channel migrating upstream, damaging Gantenbein and Marsh Lakes and threatening the upper embankment. Costs would be associated with continued repairs of the spots dikes.

Retain for further consideration? No, for technical reasons.

E4 – States/USFWS Proposal

The embankments alternative measure proposed by the WDNR, MnDNR, and USFWS would include features to minimize construction impacts (Figure 5-5). This alternative would replace the rock riprap on the upper embankment spot dikes without new sheet pile, would have no permanent access road, and would include revegetation of spot dike A, raising an 800-foot-long embankment near the dam, a 500-foot-long Marsh Lake spillway, a 600-foot-long Gantenbein Lake spillway, new Marsh Lake and Gantenbein Lake water control structures and placing rock selectively along the lower embankment at actively eroding places. All project features within 800 feet of Lock and Dam 3 would be constructed to Corps design standards. All work would be done from river access with no permanent road.

The cost would be $6,457,000 for design, construction and environmental mitigation and $52,000 for annual operation and maintenance. These costs are based on a 2001 estimate adjusted to January 2006 price levels. The cost estimate has not been updated because this alternative was eliminated from further consideration for technical reasons.

This alternative measure was proposed to keep environmental impacts low. It would be relatively inexpensive to construct but would carry with it costs associated with the high potential for failure and need for repairs. Without new sheet pile, the spot dikes would remain vulnerable to failure by scour. The grouted rock surface of spot dike A would not hold soil on top of it during high water events, preventing vegetation growth in that area. Rock riprap placed in between trees and without grading along the lower embankment would not prevent embankment failure. It would not be possible to tie in a 500-foot-long spillway between Gantenbein Lake and the river to adjacent ground, which is low. The rock riprap and rock spillway would limit movements of amphibians and turtles between the Gantenbein Lakes and the river.

Retain for further consideration? No, for technical reasons.

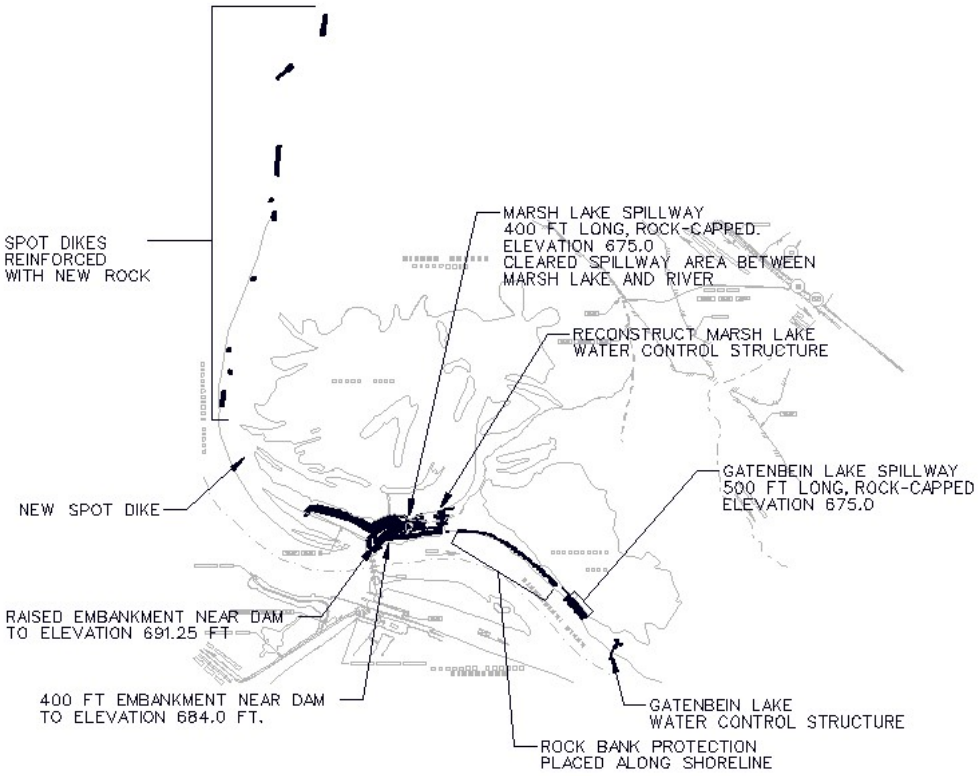


Figure 5-5. Alternative measure E4 States/USFWS proposal.

E5 – Strengthen Embankments with Phased Construction

This alternative measure was developed in an effort to identify a sufficiently robust embankment project that would significantly reduce risk of embankment failure and protect the river environment to the degree possible. This alternative would include two phases of construction for strengthening the embankment system.

In Phase 1 (Figure 5-6), the spot dikes along the upper embankment would be rebuilt. In general, the spot dikes would be reconstructed to their original design but without grouted riprap (spot dike A was raised in 1999). New sheet pile would be driven at the spot dikes, offset about 15 feet from the old sheet pile. The sheet pile would extend downward 30 feet to elevation 645 feet msl to withstand scour that could occur if the lower embankment failed. Rock riprap in the overflow channels of the spot dikes would be placed and keyed into the surrounding grade. Low areas that have scour along the upper embankment would be filled. One or two additional spot dikes would be constructed in larger existing scour channels, and a 10-foot-wide access trail of crushed rock along the upper embankment would be constructed. The access trail would enable access for construction and subsequent inspection, operation and maintenance. The existing gate at the landward end of the access trail would remain to prevent motorized recreational vehicle access. The old Marsh Lake inlet culvert at spot dike D would be replaced.

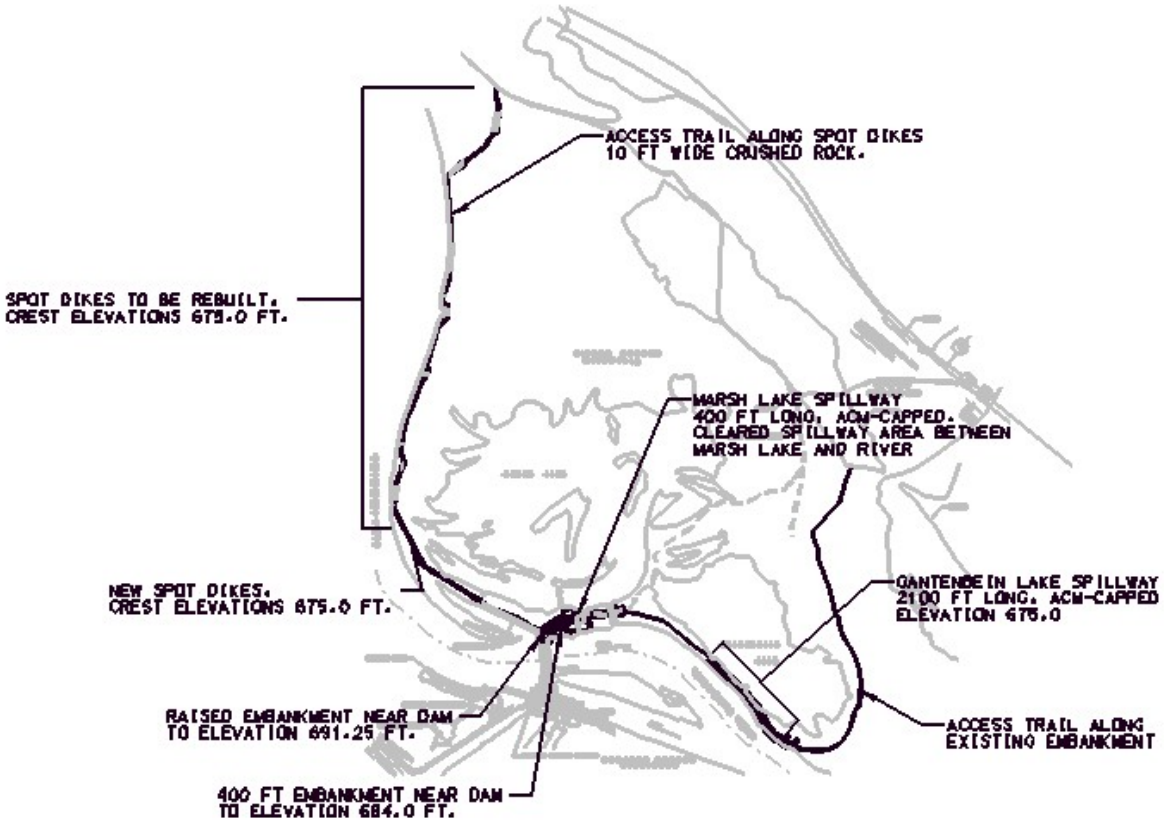


Figure 5-6. Alternative E5 strengthen embankments with phased construction, Phase 1.

During Phase 1, a raised 400-foot-long embankment near the dam would be constructed to protect the gated part of the dam with riprap along the river side. A 400-foot-long Marsh Lake spillway would be constructed. The old Marsh Lake water control structures would be replaced with one new gated culvert, with riprap along the river side. A 2,100-foot-long spillway between Gantenbein Lake and the river would be constructed, and a Gantenbein Lake water control structure would be built, with riprap along the river side.

The Marsh Lake and Gantenbein Lake water control structures would be built with sheet pile weirs to maintain minimum water levels in the two lakes to limit head at the embankments and to protect their structural integrity. The water control structures would also contribute to meeting the planning objective of protecting the river environment by maintaining the existing hydrologic regime of the Gantenbein Lakes wetland area.

The spillways would be constructed with articulated concrete mat (ACM), keyed into grade with rock on the upstream side and underwater downstream side. The ACM spillways and areas disturbed by construction would be planted with sandbar willow (*Salix interior*) and other native flood-tolerant wetland plants. The sandbar willow stems would bend over and not unacceptably impede flow over the spillways during high water events. The ACM spillways with vegetation would be visually less intrusive than riprap and would allow movements of amphibians and turtles between the Gantenbein Lakes and the river.

The Phase 1 work would leave the area between the Marsh Lake and Gantenbein Lake spillways unprotected, along with the area from the downstream end of the Gantenbein Lake spillway around the south end of Gantenbein Lake to the bluff. The embankments would be inspected regularly and after overtopping events.

If conditions warrant, an interagency team with hydraulic engineers, geotechnical engineers, and dam safety engineers from the St. Paul District and the WDNR would inspect the unprotected areas to determine the best course of action (interim repairs or partial or complete Phase 2 project construction). Additional segments of the lower embankment would be built to the E3 design (Figure 5-7) as needed.

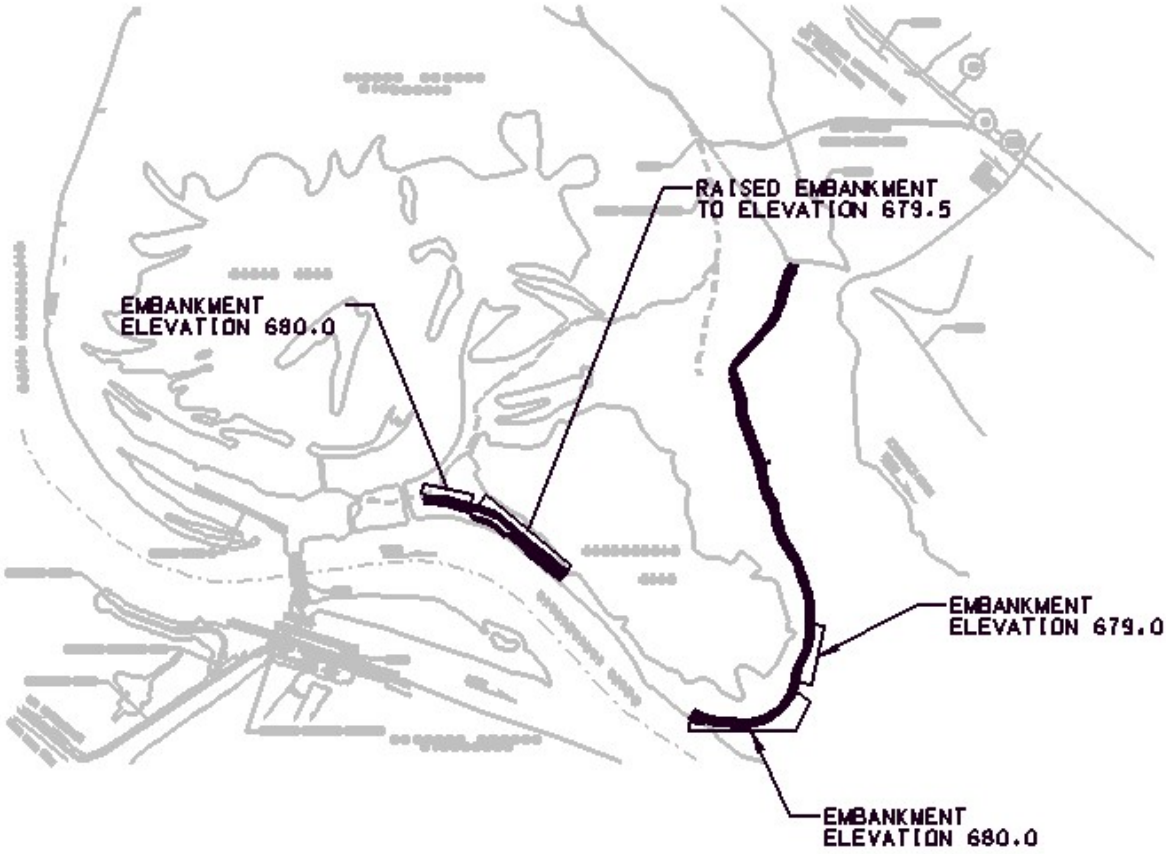


Figure 5-7. Alternative E5 strengthen embankments with phased construction, Phase 2.

The phase 2 embankments would be low earthen embankments with buried riprap built to a crest elevation of 680.0 feet msl and 679.0 feet msl at the south end of Gantenbein Lake (Figure 5-7), stepping up to elevation 695 feet msl near the Wisconsin bluff (see Plates 25 through 33).

The total project (Phase 1 and Phase 2) cost would be $33,644,000 for design, construction and environmental mitigation and $275,000 for annual operation and maintenance.

This alternative would limit construction impacts while significantly reducing the risk of embankment failure. The use of ACM on the spillways would limit the amount of riprap along the lower embankment and avoid the mussels in the tailwater. The ACM would be less visually

intrusive than riprap and would allow movements of amphibians and turtles. The spillways would be long enough to tie into somewhat higher ground at the ends and have enough capacity to spread out the flow during high water events. This alternative would limit the construction impact during the first phase of construction, leaving floodplain forest wetland areas undisturbed until construction of the embankment system through those areas is needed.

Retain for further consideration? Yes.

5.1.2.4 Mitigation for Embankments Construction

Avoid and minimize measures would include limiting the construction disturbance footprint, construction site erosion control measures, silt curtains in the spot dike channels to limit sediment movement during construction, seasonal timing of construction to avoid the fall waterfowl migration season, construction access from the river for phase 1 work on the lower embankment, limiting construction staging areas to the minimum needed, use of ACM spillways and adjusted alignment of riprap to avoid encroachment on mussel beds in the tailwater, planting of sandbar willows and other flood-tolerant plants on the spillway crests, and replanting floodplain forest trees and flood-tolerant plants on the other areas disturbed by construction.

Strengthening the embankments would unavoidably affect floodplain forest, wetland habitat and channel border habitats that are or support significant resources. The compensatory mitigation being proposed would be to purchase 313 acres of floodplain agricultural land in fee from willing sellers nearby (in the Mississippi River floodplain or the Trimbelle River or Rush River valleys in Wisconsin). The area of mitigation land needed is based on a Habitat Evaluation Procedure (HEP) analysis (Environmental Mitigation Appendix G). The mitigation land would be planted to a variety of floodplain forest and herbaceous vegetation and monitored for ten years and replanted as necessary to ensure establishment. If the WDNR is willing to manage the property, the St. Paul District would enter into a real estate outgrant agreement with the WDNR for use of the mitigation land as a wildlife management area.

The estimated cost of real estate acquisition for environmental mitigation for the E5 embankments alternative is $1,512,000. The estimated cost of floodplain forest restoration on the mitigation land is $256,000.

5.1.3 Summary of Alternative Measures Screening

Alternative measures that were retained for further consideration in plan formulation are shown in Table 5-4. The rest of the alternative measures identified above were dropped from further consideration.

Table 5-4. Alternative navigation safety and embankments improvement measures retained for further consideration.

Navigation Alternative Measures
N1 No action (Without-project future condition for reference only)
N6 Extend landward guide wall, channel modifications
Embankments Alternative Measures
E1 No action (Without-project future condition for reference only)
E2 Strengthen embankments
E5 Strengthen embankments with phased construction

5.2 Formulation of Alternative Plans

Alternative plans are combinations of alternative measures that would contribute to attaining the planning objectives. Because navigation accidents at Lock and Dam 3 can cause overtopping of the Wisconsin embankments and lead to embankment system failure, reduction in the risk of both navigation accidents and embankments failures is needed. Project objectives (Section 2.8 above) include (1) Improve navigation safety and reduce risk of navigation accidents, (2) reduce risk of embankment failure, and (3) protect the river ecosystem. Stand-alone embankments plans and stand-alone navigation safety improvements plans would not meet project objectives and were not considered. In addition to the no action plan, the combination plans that were considered are shown in Table 5-5.

Table 5-5. Alternative Plans for Lock and Dam 3, combining navigation safety and embankments improvements.

No action
N6E2 Extend landward guide wall, channel modifications and strengthen embankments
N6E5 Extend landward guide wall, channel modifications and strengthen embankments with phased construction

5.3 Evaluation of Alternative Plans

Plan evaluation criteria include completeness, efficiency, effectiveness, and acceptability (Corps of Engineers 2000a). Completeness is the extent to which the alternative plans would provide and account for all necessary investments or other actions to ensure the realization of the planning objectives, including actions by other Federal and non-Federal entities. Effectiveness is the extent to which the alternative plans would contribute to achieve the planning objectives. Efficiency is the extent to which an alternative plan would be the most cost effective means of achieving the objectives. Acceptability is the extent to which the alternatives would be acceptable in terms of applicable laws, regulations, and public policies.

We coordinated with representatives from the navigation industry and governmental agencies to solicit their input and assistance during this study. They helped identify potential solutions to the problems, helped screen the many alternatives to a manageable number for evaluation purposes, and provided feedback on effectiveness and acceptability of the alternative plans.

Economic benefits for an alternative take the form of reduced life-cycle costs of the alternative with-project condition compared to the without-project condition. For this project, life-cycle costs include all costs or damages that would occur over the 50-year planning period:

Navigation incident	Embankment failure
Repairs to towboats / barges	Repairs to spot dikes and embankments
Repairs to lock and dam structure	Cost of power plant shutdown with accidental drawdown of Pool 3
Response and cleanup of spilled hazardous cargo	Loss of navigation benefits with accidental drawdown of Pool 3
	Repairs to Pool 3 marinas with accidental drawdown of Pool 3

Life cycle costs also include operation and maintenance costs, including periodic rehabilitation costs, for the lock and dam and for the embankments.

A project would produce benefits by reducing the potential for navigation incidents and embankment system failure and subsequent damages and costs.

As stated earlier in section 3.2.3, navigation accidents and embankment failures are related. Barges broken free from a tow may lodge in the dam gates causing overtopping of the embankments leading to embankment failure and accidental drawdown of Pool 3. Planning objectives for this project (section 2.5 above) address both the navigation safety and embankments problems. Therefore, combination plans, not stand-alone navigation or embankments plans, were evaluated.

Detailed examination of costs and benefits of the alternative plans is provided in the economics appendix (Appendix E).

5.3.1 Without-Project Condition

Table 5-6 below summarizes the life-cycle costs by general category for the future without-project condition expressed on an average annual basis. The costs reflect the probabilities of navigation accidents and embankment failures with and without navigation accidents (see the economics appendix (Appendix E) for further detail on the risk and benefit-cost assessment). Historical risks of navigation incidents and associated costs and damages would be expected to extend throughout the 50-year project-planning horizon. Average annual life-cycle costs amount to $9,675,400, of which nearly 90 percent are related to an accidental pool drawdown, either with or without a navigation incident. See Table 5-9 for a display of these costs in greater detail.

Table 5-6. Average annual life-cycle cost summary for the future without-project condition

Category	Cost ($000)	% of Total
Embankment repair costs with a navigation incident	36.94	0.4
Pool drawdown costs with a navigation incident	6,600.38	68.2
Direct costs with navigation incidents	825.95	8.5
Embankment repair costs without a navigation incident	118.91	1.2
Pool drawdown costs without a navigation incident	2,093.17	21.6
Total life-cycle cost	9,675.36	100.0

The future without-project condition would also include the adverse environmental effects and associated monetary and non-monetary costs of navigation accidents, embankments failure and accidental drawdown of Pool 3 described in Section 3.3 above.

5.3.2 Alternative Measures and Project Costs

The project costs include estimates of first costs for construction, operation and maintenance, and environmental mitigation.

N1 - Base Condition (Without-Project Condition) – This base condition, which is not an alternative measure, represents the status quo of operations under historical, current and future conditions. For benefit-cost calculation purposes, this condition serves as the base against which life-cycle costs for the other navigation and embankment alternatives are compared. As the base condition, life-cycle costs would be expected to be greatest under this condition; other alternatives would have the effect of reducing repairs, damages, accidents, cleanup, etc., compared with the base condition. The base condition will be used as a reference to evaluate the alternative plans.

N6 - Extend Landward Guide Wall and Channel Modifications - This alternative measure is designed to improve navigability in the upper approach to the lock. It would involve construction of an extended guide wall and dredging of the main channel and filling along the riverbank on the Minnesota side of the river. The first cost for this alternative is $30,227,000. On an average annual basis, including annual operation and maintenance costs of $247,000, this cost is equivalent to $1,934,900. The net expectation would be an approximately 60-percent reduction in the frequency of navigation incidents that occur during outdraft conditions. A triangular distribution with minimum and maximum values of 50 percent and 70 percent and most likely value of 60 percent was selected for the percent reduction in the probability of a navigation incident with this alternative.

E2 - Strengthen Embankments - Strengthening of embankments is expected to result in less likelihood of embankment failure and drawdown of Pool 3. Drawdown of Pool 3 would also have adverse impacts on the operations of the Prairie Island Nuclear Plant and the Alan S. King Plant in addition to direct reduction in commercial navigation. The first cost for this alternative

would be $21,452,000. With annual operation and maintenance costs of $176,000, the average annual cost for this alternative would be $1,373,900.

E5 - Strengthen Embankments – Phased Construction - This alternative would include rebuilt spot dikes, a raised embankment near the dam, new Marsh Lake and Gantenbein Lake spillways and outlet structures, ACM on the spillways and future as-needed construction of the lower embankment in the areas remaining unprotected in Phase 1. The first cost for this alternative would be $33,644,000. Including annual operation and maintenance costs of $275,000, average annual cost for this alternative would amount to $2,153,700.

Table 5-7 summarizes costs for the individual alternative measures that have not been eliminated from further consideration and for the plan combinations.

Table 5-7 - Summary of costs of alternatives.

Alternative	Project First Costs	Average Annual First Costs *	Annual O&M Cost	Total Average Annual Cost
E2	$21,452,000	$1,197,900	$176,000	$1,373,900
E5	33,644,000	1,878,700	275,000	2,153,700
N6	30,227,000	1,687,900	247,000	1,934,900
Plan N6E2	51,679,000	2,885,800	423,000	3,308,800
Plan N6E5	63,871,000	3,566,600	522,000	4,088,600
* Costs amortized at 5-1/8 percent over 50 years				

5.3.3 Risk and Benefit-Cost Assessment

A model was developed by The Cadmus Group, Inc. and the Corps PDT members to analyze benefits and risk to support the planning effort for this study. See Attachment 1 in the economics appendix (Appendix E). The report documenting the methodology and results of this model serves as the basis for the economic evaluation of the alternative plans.

5.4 Comparison of Alternative Plans

Table 5-8 displays the life-cycle costs by general category for the with-project conditions. The with-project condition is the future with the alternative plans in place. These residual costs are expected to be incurred with Plans N6E2 or N6E5 in place. The difference between these costs and those for the base condition (N1E1) are the project benefits. See Table 5-9 for a display of these costs in greater detail.

Table 5-8. Average annual life cycle costs for the with-project condition.

	Cost ($000)	
Category	N6 E2	N6 E5
Embankment repair costs with a navigation incident	28.91	37.71
Pool drawdown costs with a navigation incident	1,212.41	488.19
Direct costs with navigation incidents	396.40	396.40
Embankment repair costs without a navigation incident	80.69	80.95
Pool drawdown costs without a navigation incident	571.17	131.98
Life-cycle costs with alternative in place	2,289.58	1,135.22

Table 5-9 below presents the detailed life-cycle costs and benefits and benefit-cost ratios by alternative. The embankment repair costs (top part of Table 5-9) were estimated by a panel of experts for different scenarios of failure of the upper (U), intermediate (I), and lower (L) embankments. The cost of a hazardous materials spill was estimated based on information from the MPCA. Xcel Energy provided the estimates for the cost of forced shutdown of the power plants. These estimates were confirmed by the Mid-America Power Pool, a consortium of utilities that coordinates electrical power distribution in the upper Midwest and by the U.S. Army Corps of Engineers Hydropower Center of Expertise. Details of the risk and benefit:cost assessment are provided in Attachment 1 of the economics appendix (Appendix E).

Plan N6E2 would reduce average annual life-cycle costs from $9,675,400 to $2,289,600. The benefit would amount to $7,385,800 or a reduction of life-cycle costs of 76.3 percent. With an average annual cost of $3,308,800, the net benefit for Plan N6E2 would be $4,077,000, and it would have a benefit-cost ratio of 2.23.

Plan N6E5 would reduce average annual life-cycle costs from $9,675,400 to $1,135,200. The benefit would amount to $8,540,200 or a reduction of life-cycle costs of 88.3 percent. With an average annual cost of $4,088,700, the net benefit for Plan N6E2 would be $4,451,500, and it would have a benefit-cost ratio of 2.09. Note that Plan N6E5 would have a lower benefit-cost ratio but it would have a greater net benefit value.

Table 5-9 Average annual life cycle costs by category ($1,000).

	Alternative		
Category	N1 E1	N6 E2	N6 E5
Embankment repair costs with a navigation incident	Base Condition		
Cost in U1 with a navigation incident	5.11	3.82	4.99
Cost in U2 with a navigation incident	5.64	4.57	5.96
Cost in I with a navigation incident	5.70	4.83	6.29
Cost in L1 with a navigation incident	5.73	3.10	4.04
Cost in L2 with a navigation incident	5.25	4.47	5.84
Cost in L3 with a navigation incident	5.57	4.74	6.18
Cost in L4 with a navigation incident	3.95	3.38	4.40
Subtotal	36.94	28.91	37.71
Accidental pool drawdown costs with a navigation incident			
Cost to repair breached spot dikes to reestablish the pool	494.08	19.38	19.00
Cost of Prairie Island Nuclear Plant shutdown	2,538.00	496.50	195.04
Cost of Alan S. King Plant shutdown	1,311.44	256.55	100.78
Cost of navigation delays	1,903.06	370.59	146.15
Cost of marina damages	3.75	0.73	0.29
Cost of minor dam repairs	34.18	6.70	2.63
Cost of major dam repairs	314.91	61.76	24.22
Cost of minor vessel repairs	0.15	0.03	0.01
Cost of major vessel repairs	0.80	0.16	0.06
Subtotal	6,600.38	1,212.41	488.19
Direct costs with navigation incidents			
Cost of nonhazardous outdraft incidents	4.05	1.61	1.61
Cost of hazardous outdraft incidents	405.41	162.55	162.55
Cost of nonhazardous non-outdraft incidents			

	1.25	0.50	0.50
Cost of hazardous non-outdraft incidents	293.27	118.13	118.13
Cost of injury from navigation incidents	-	-	-
Cost of disability from navigation incidents	-	-	-
Cost of fatality from navigation incidents	-	-	-
Cost of spills from hazardous outdraft incidents	8.11	3.25	3.25
Cost of spills from hazardous non-outdraft incidents	5.87	2.36	2.36
Cost of helper boats	108.00	108.00	108.00
Subtotal	825.95	396.40	396.40
Embankment repair costs without a navigation incident			
Cost in U1 without a navigation incident	11.56	9.82	9.85
Cost in U2 without a navigation incident	17.85	9.90	9.93
Cost in I without a navigation incident	21.32	21.54	21.60
Cost in L1 without a navigation incident	29.02	7.34	7.37
Cost in L2 without a navigation incident	13.15	8.76	8.79
Cost in L3 without a navigation incident	17.84	14.42	14.46
Cost in L4 without a navigation incident	8.17	8.91	8.94
Subtotal	118.91	80.69	80.95
Accidental pool drawdown costs without a navigation incident			
Cost to repair breached spot dikes to reestablish the pool	58.03	9.16	5.17
Cost of Prairie Island Nuclear Plant shutdown	806.73	234.18	52.83
Cost of Alan S. King Plant shutdown	416.86	121.00	27.30
Cost of navigation delays	598.40	174.02	39.26
Cost of marina damages	1.19	0.35	0.08
Cost of minor dam repairs	10.93	3.17	0.72
Cost of major dam repairs	100.72	29.20	6.60

Cost of minor vessel repairs	0.05	0.01	0.00
Cost of major vessel repairs	0.26	0.07	0.02
Subtotal	2,093.17	571.17	131.98
Construction and O&M costs			
Cost of navigation alternative	-	1,934.94	1,934.94
Cost of embankment alternative	9.64	1,373.93	2,153.76
Subtotal	9.64	3,308.88	4,088.70
Average annual project cost (including O&M)	-	3,308.88	4,088.70
Life cycle cost of alternative	9,675.36	2,289.58	1,135.22
Benefit of alternative	-	7,385.79	8,540.14
Net benefit of alternative	-	4,076.91	4,451.45
Benefit-cost ratio of alternative	--	2.23	2.09

5.5 Plan Selection

Selecting a plan is the final step in the planning process. The criteria for selecting a plan depend on the nature of the project and the type of outputs (benefits) produced. For this study, the plans have been analyzed in terms of the cost savings benefits that they would produce over the 50-year planning period. Benefits of this type are economic in nature and are referred to as National Economic Development (NED) benefits. Corps planning guidance directs that, if NED criteria serve as the basis for plan selection, the plan to be selected is the one that maximizes net economic benefits, that is, the plan in which net benefits are greatest. Of the two plans carried forward through the complete planning process, N6E2 and N6E5, the one that would have greater net benefits, as shown in Table 5-6 above, is N6E5. Therefore, as a result of the planning process, Plan N6E5 is recommended for implementation to address the navigation safety and embankment reliability problems at Lock and Dam 3.

CHAPTER 6. RECOMMENDED PLAN

The N6E5 tentatively recommended plan would consist of an extended guide wall with channel modifications and strengthened Wisconsin embankments with phased construction and associated environmental mitigation.

6.1. Navigation Safety Improvements – Extended Guide Wall and Channel Modifications

The existing landward guide wall would be extended 862 feet (Figures 6-1, 6-2, 6-3, and 6-4). See the structures appendix (Appendix I). A pile-supported concrete wall would be constructed with a continuous concrete rubbing surface. The bottom of the concrete would be at the river surface elevation to allow the wall to be constructed almost entirely from above the water surface. The bottom of the rubbing surface would be 3 feet below normal pool; a concrete skirt panel would hang 8 feet below that to control crosscurrents along the wall. The guide wall would have bollards to tie off barges, lights, signage and access. At the upstream end of the wall, a 50-foot-diameter concrete filled steel sheet pile cell would protect the end of the wall from direct collisions. The sheet pile cell bullnose would have a navigation light, power, access, and signage.

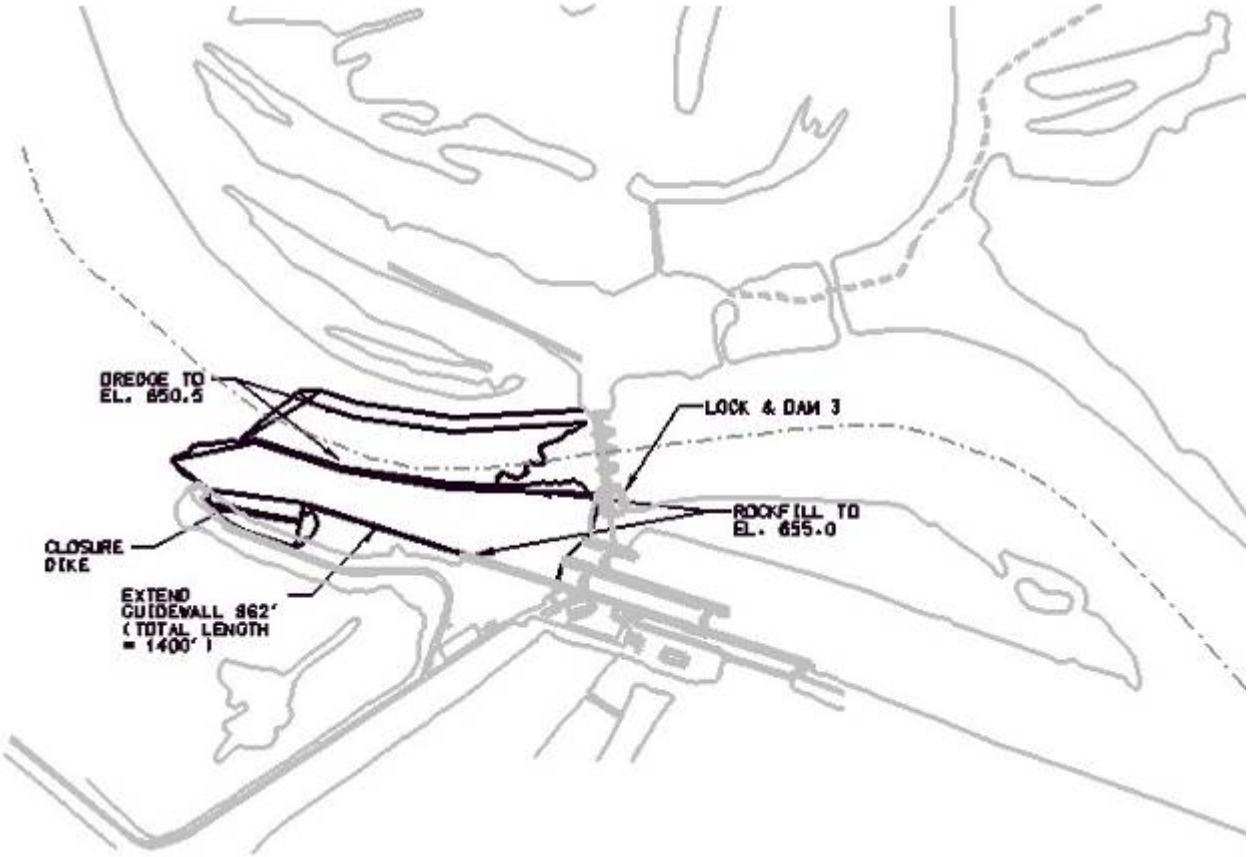


Figure 6-1. Recommended plan for navigation safety improvements at Lock and Dam 3.

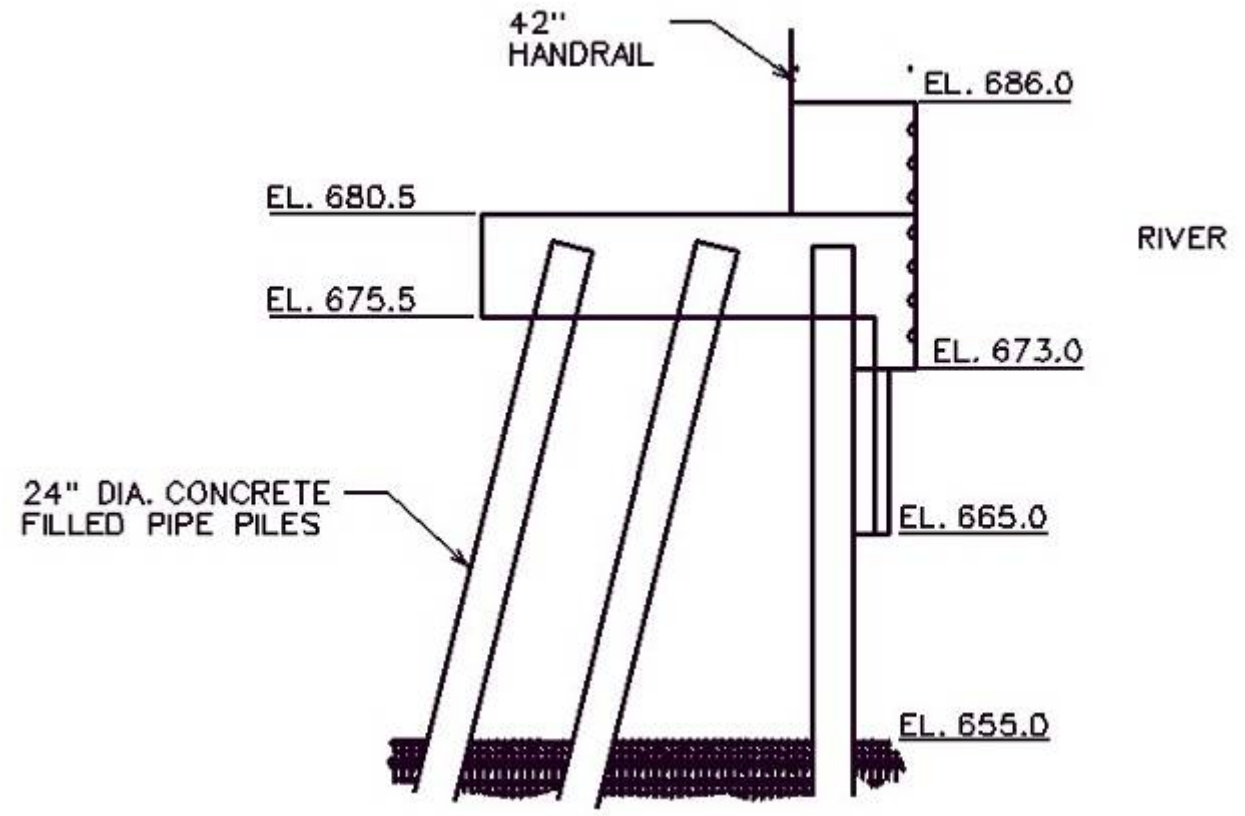


Figure 6-2. Extended guide wall design with concrete cap on pilings.

A berm, or closure dike, would be constructed between the upstream end of the guide wall and the Minnesota bank to keep woody debris from accumulating behind the guide wall (Figures 6-1 and 6-4). The berm would be constructed of sandfill, and the upstream side would be armored with rock. Topsoil would be placed and grass would be planted on the downstream side of the berm.

The main channel would be dredged to reduce the outdraft current and to route flow more toward the Wisconsin side of the river and into the gated part of the dam. The dredged material (118,000 cy of sand) would be placed in the lock approach to fill it to a minimum depth of 20 feet below project pool level, and the area would be armored with 98,500 cy of rock to hold it in place. The riprap cap in this area would have 24-inch and 36-inch-diameter rock.

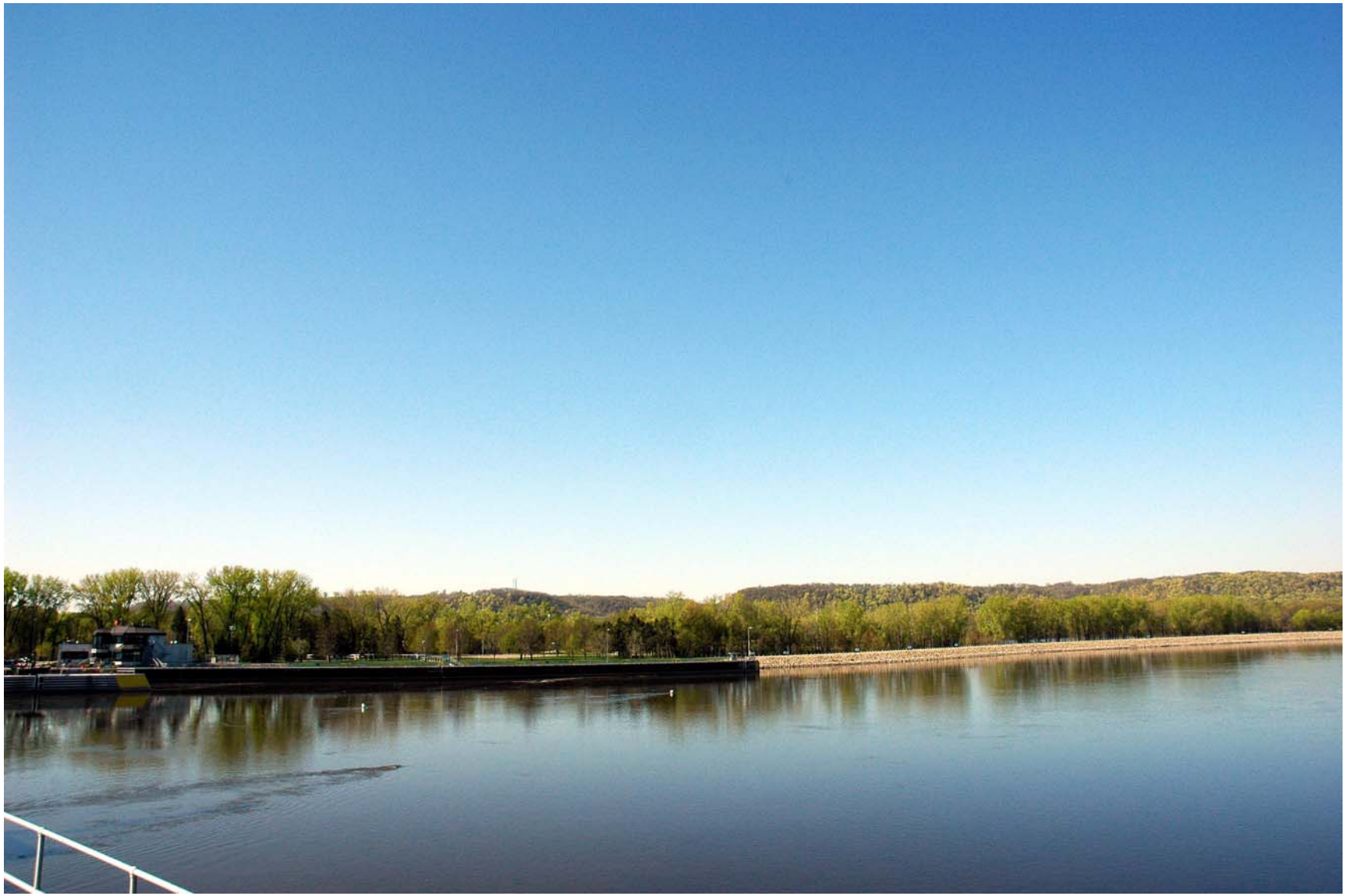


Figure 6-3. Photograph of the existing upper guide wall at Lock and Dam 3. May 2006 photo.

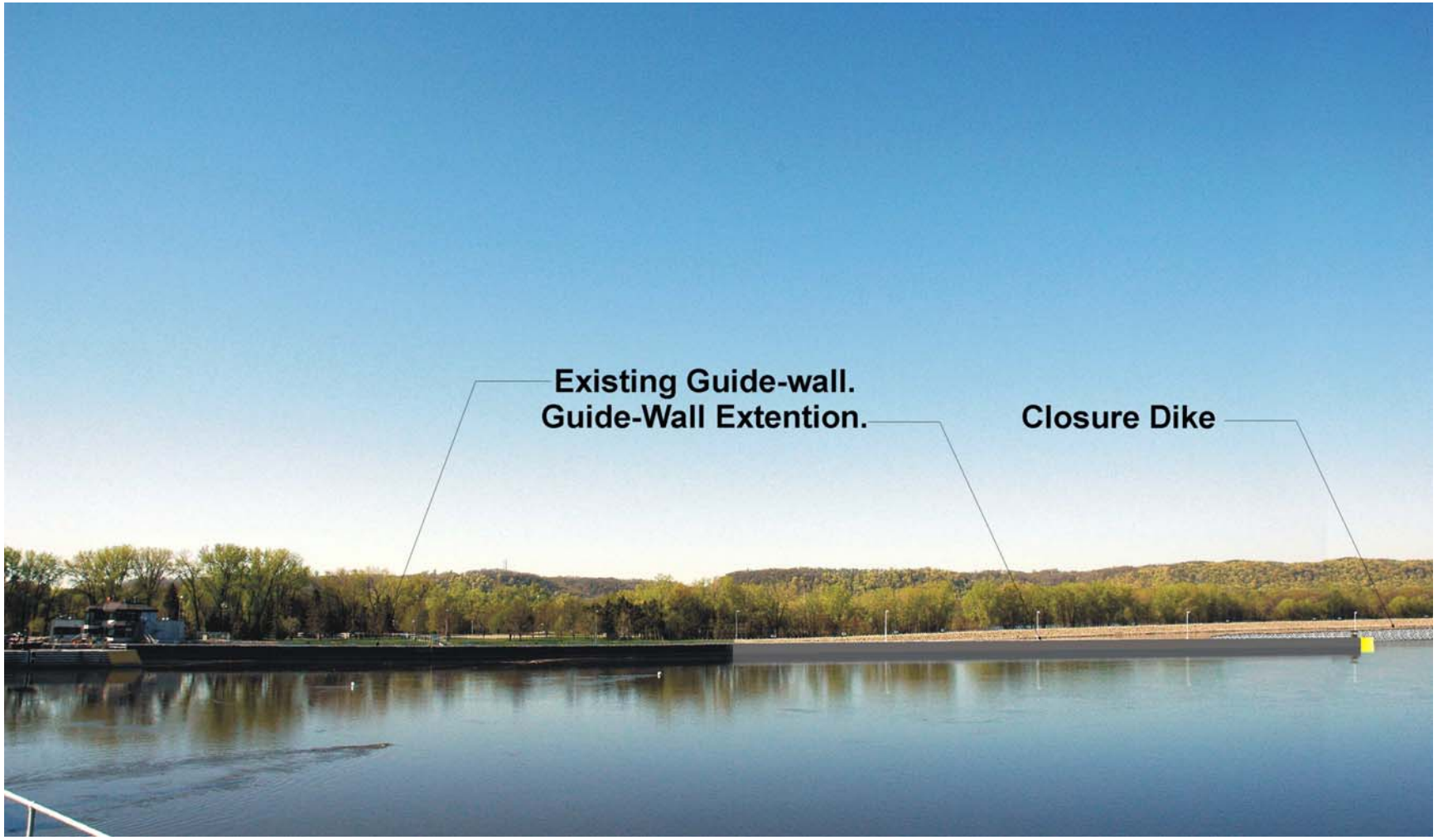


Figure 6-4. Simulated image of an extended upper guide wall at Lock and Dam 3.

6.1.1 Monitoring

The geometry of the dredge cut and filled area in the lock approach would be monitored for several years to track changes in sediment movement and settlement of the rock cap in the filled area. Hydraulic performance of the channel modifications would be monitored during several levels of river discharge to determine the degree to which the outdraft current is reduced and measure any changes in distribution of flow through the dam gates. Interviews with towboat pilots would be conducted to assess changes to navigability of the upper lock approach.

6.1.2 Construction

A preliminary project management plan for construction is provided in Appendix M. The dredging and material placement would be done using mechanical equipment (hydraulic excavator, barges). The rock cap material in the filled area of the lock approach would be brought in by barge and placed with a hydraulic excavator. The dredging, fill, and guide wall construction would all take place during the winter to avoid interfering with navigation and with fish spawning in the tailwater. Most work on the guide wall would be done with access from land. The work would take 2 years to complete.

6.1.3 Operation and Maintenance

Operation and maintenance of the guide wall would include routine inspections and needed repairs to the structure.

6.1.4 Environmental Mitigation

Dredging and rock placement would be done during June through February to avoid and minimize disturbance to walleye and sauger that spawn in the tailwater in the spring. The larger sized rocks used to cap the filled area in the lock approach would provide sheltered microhabitats for fish and hard stubstrate for filter-feeding macroinvertebrates.

Because no losses of significant resources would result, and because the habitat changes associated with the channel modifications would increase production of benthic macroinvertebrates and improve fish habitat in the area, no compensatory mitigation is proposed for the navigation safety improvement portion of the project.

The environmental mitigation plan is in Appendix J.

6.2 Strengthen Embankments with Phased Construction

6.2.1 Phase 1

In Phase 1 of the embankments construction (Figure 6-5), the spot dikes along the upper embankment would be rebuilt. New sheet pile would be driven at the spot dikes, offset about 15 feet from the old sheet pile. The sheet pile would extend downward 30 feet to elevation 645 feet

msl to withstand scour that would occur if the lower embankment failed. Rock riprap in the overflow channels of the spot dikes would be placed and keyed into the surrounding grade. Low areas that have scour along the upper embankment would be filled. One or two additional spot dikes would be constructed in larger existing scour channels, and a 10-foot-wide access trail of crushed rock along the upper embankment would be constructed to enable access for construction and later inspections and maintenance activities. The old Marsh Lake inlet culvert at spot dike D would be replaced. Silt curtains would be installed in the spot dike channels to limit sediment movement into the river and Marsh Lake during construction.

Figure 6-6 is an oblique aerial photograph of part of the upper embankment near Lock and Dam 3. Figure 6-7 is a simulated illustration of the same part of the upper embankment with rebuilt spot dikes.

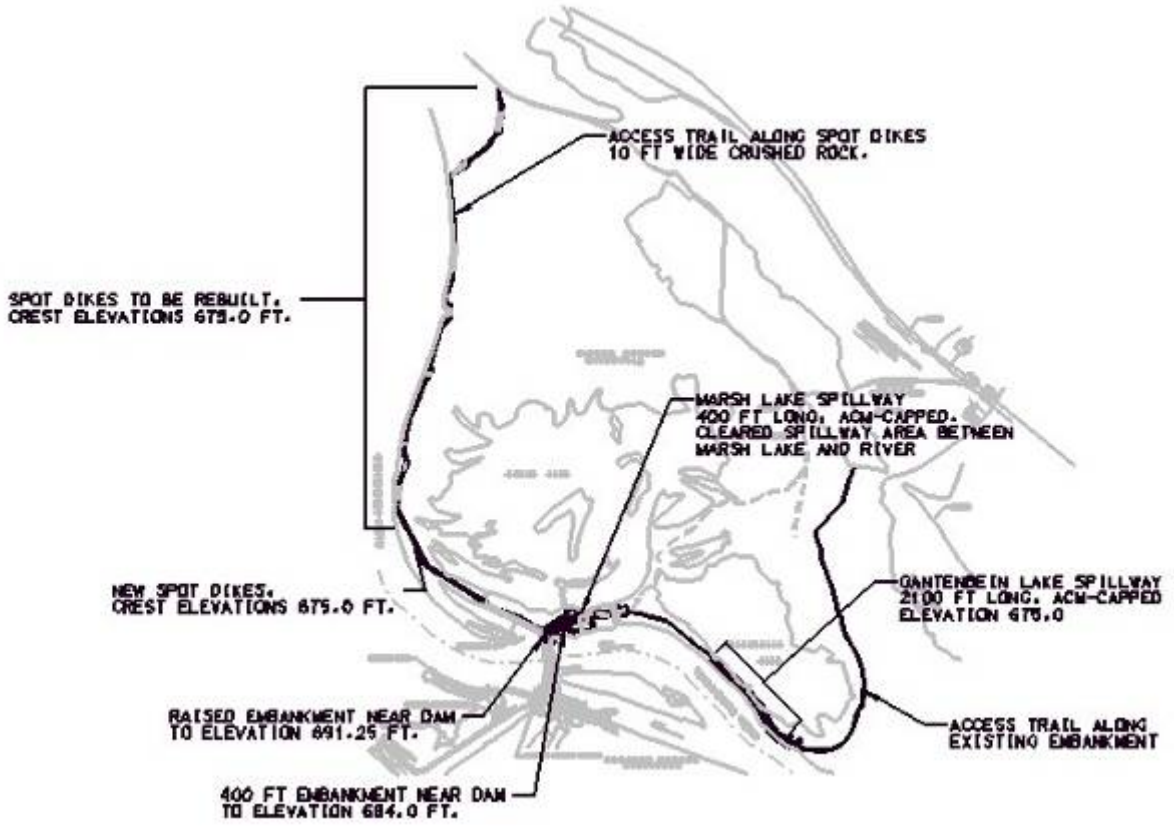


Figure 6-5. Alternative E5 strengthen embankments with phased construction, Phase 1.

Figure 6-6. Part of the upper embankment and Marsh Lake looking southeast. May 2006 photo.

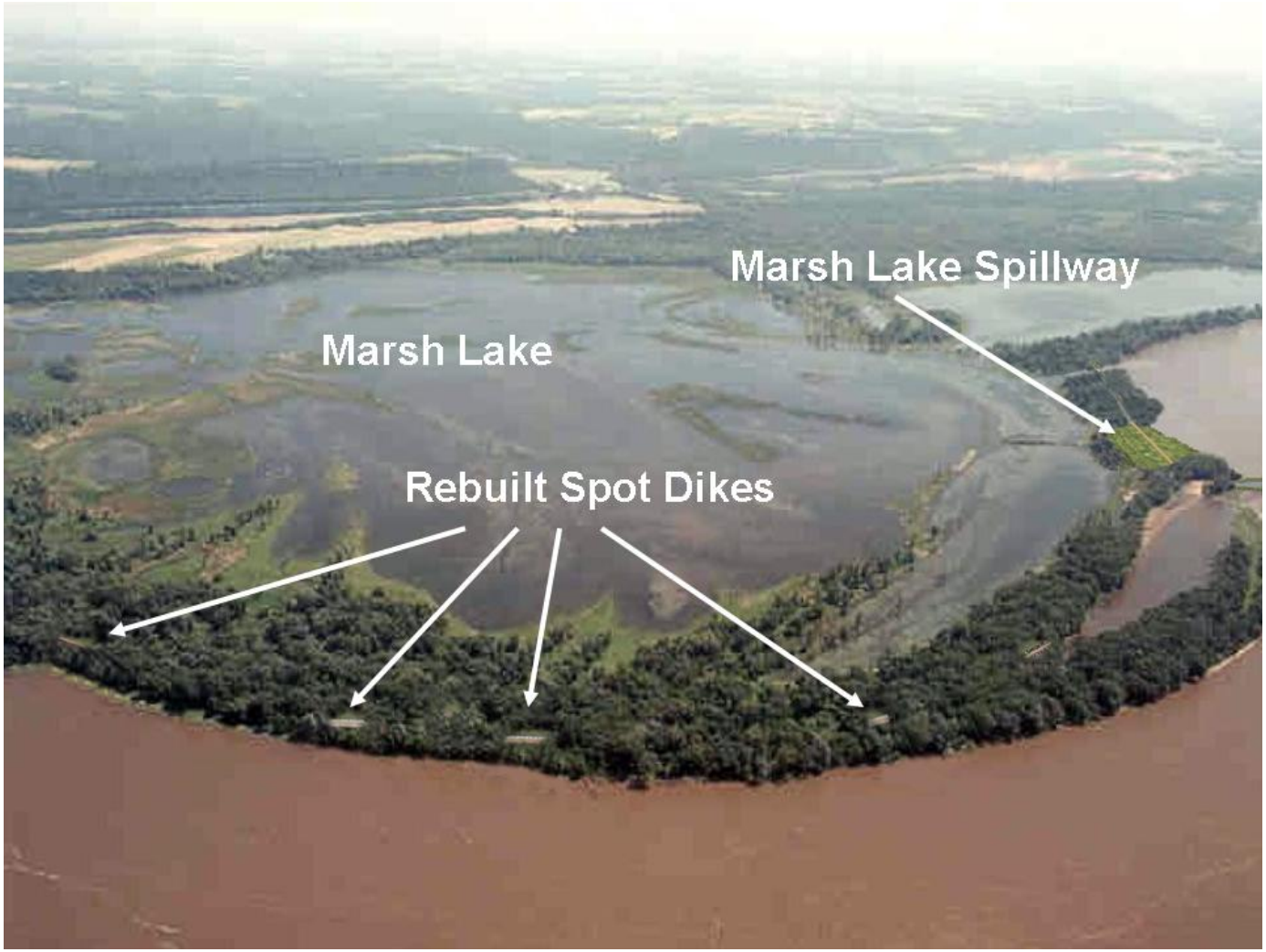


Figure 6-7. Simulated illustration of part of the upper embankment and Marsh Lake with rebuilt spot dikes and Marsh Lake spillway.

A raised 400-foot-long embankment near the dam would be constructed to protect the gated part of the dam. A 400-foot-long Marsh Lake spillway would be constructed. The old Marsh Lake water control structures would be replaced with a new stoplog culvert water control structure. A 2,100-foot-long spillway between Gantenbein Lake and the river would be constructed, and a stoplog culvert Gantenbein Lake water control structure would be built.

The Marsh Lake and Gantenbein Lake water control structures would be built with sheet pile weirs to maintain minimum water levels in the two lakes to limit head at the embankments and to protect their structural integrity.

The spillways would be constructed with ACM, keyed into grade with rock on the upstream side and underwater downstream side. Figure 6-6 shows an ACM installation with native vegetation planted into the ACM blocks. Figure 6.7 is a cross section diagram of the ACM spillways. The ACM spillways and areas disturbed by construction would be planted with sandbar willow and other native flood-tolerant wetland plants. The sandbar willow stems would bend over and not unacceptably impede flow over the spillways during high water events (Freeman et al. 2000). The ACM spillways with vegetation would be visually less intrusive than riprap-capped spillways and would allow movements of amphibians and turtles between the Gantenbein Lakes and the river.

Figure 6-8 shows the existing area near the dam and the upstream part of the lower embankment. Figure 6-9 is a simulation of the with-project condition in the same area. Figure 6-10 is an oblique aerial photograph of the downstream part of the lower embankment. Figure 6-11 is a simulation of the with-project condition.

Phase 1 construction of the lower embankment would be accessed from the river. Landing areas for materials and equipment and construction staging areas will be delineated during development of the Design Documentation Report. Construction staging areas will be kept to the minimum area necessary. A preliminary project management plan for construction is provided in Appendix M.

Figure 6-8. An example articulated concrete mat (ACM)-capped spillway planted with native vegetation.

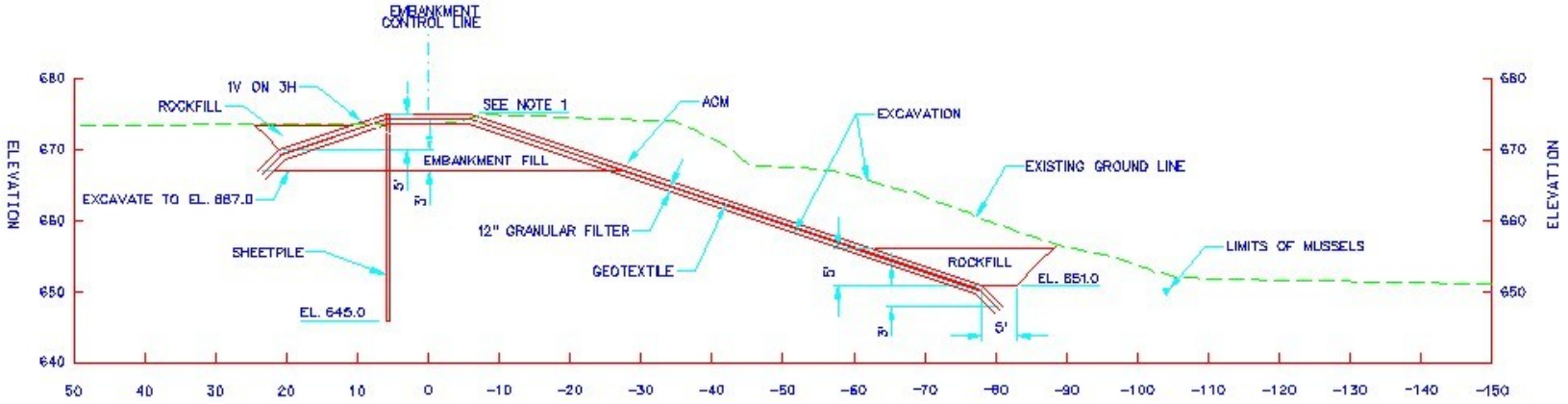


Figure 6-9. Cross section drawing of Marsh and Gantenbein Lakes spillways with articulated concrete mat (ACM).

Figure 6-10. Lock and Dam 3 on left, Mississippi River in foreground, Marsh Lake at upper right and the upstream part of the lower embankment. May 2006 photo.

Figure 6-11. Simulated illustration of Lock and Dam 3 and the with-project condition, with raised embankment near the dam, articulated concrete mat (ACM) Marsh Lake spillway and Marsh Lake outlet structure.

Figure 6-12. Lock and Dam 3 looking upriver. Gantenbein Lake and lower embankment at right center. July 2000 photo.

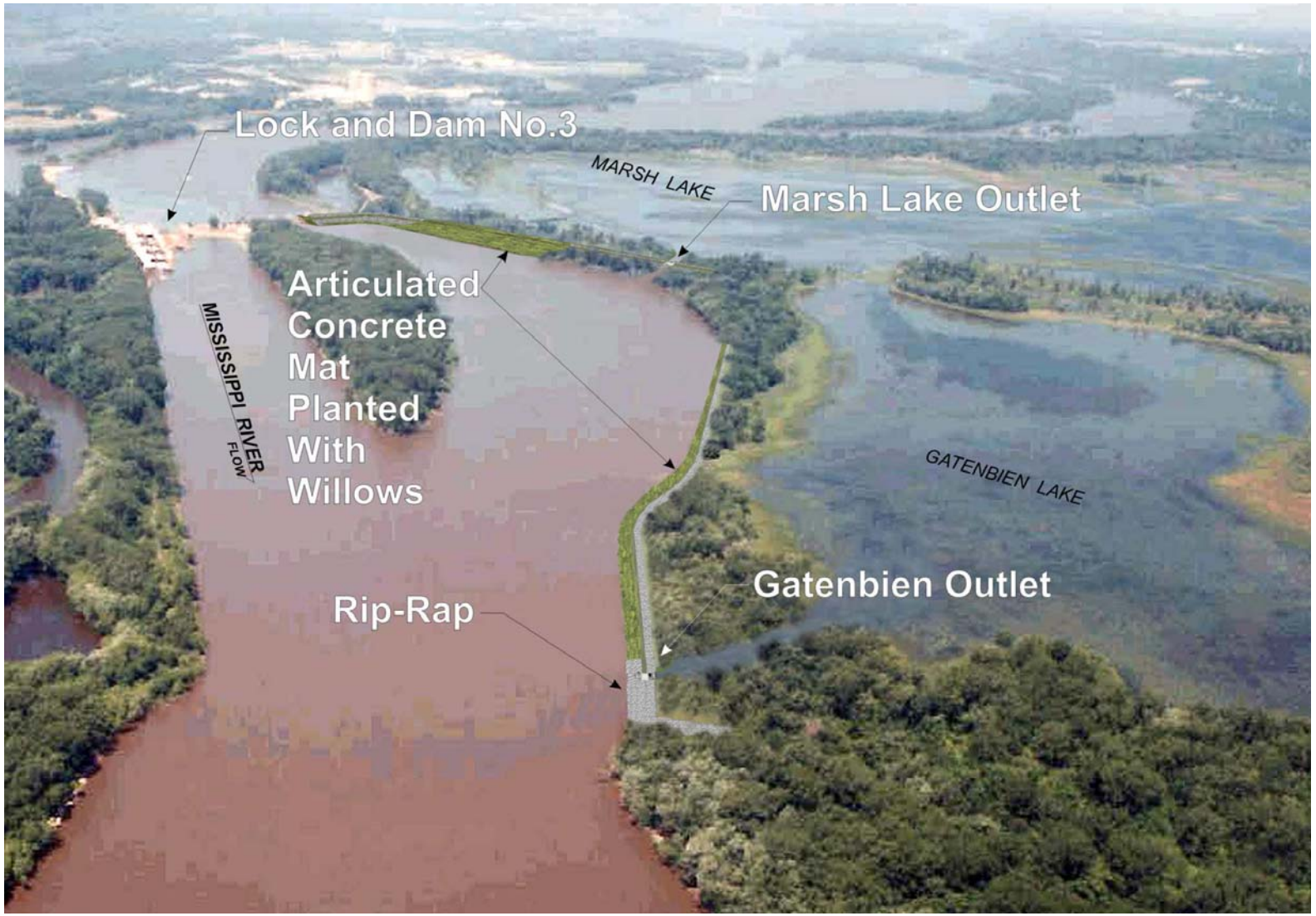


Figure 6-13. Simulated illustration of Lock and Dam 3 and the lower embankment with-project conditions, with articulated concrete mat (ACM) Gantenbein lake spillway and outlet structure.

6.2.2 Phase 2

The Phase 1 work would leave the wider land area between the Marsh and Gantenbein Lakes spillways unprotected, along with the area from downstream end of the Gantenbein Lake spillway around the south end of Gantenbein Lake to the bluff. The embankments would be inspected regularly and after overtopping events. If breaches through the unprotected areas were to occur, additional segments of the lower embankment would be built (Figure 6-12) as needed. If Phase 2 construction of the lower embankment around the south end of Gantenbein Lake was needed, an access trail for light trucks and personnel would be extended from the existing trail, around the south end of Gantenbein Lake to the end of the Gantenbein Lake spillway.

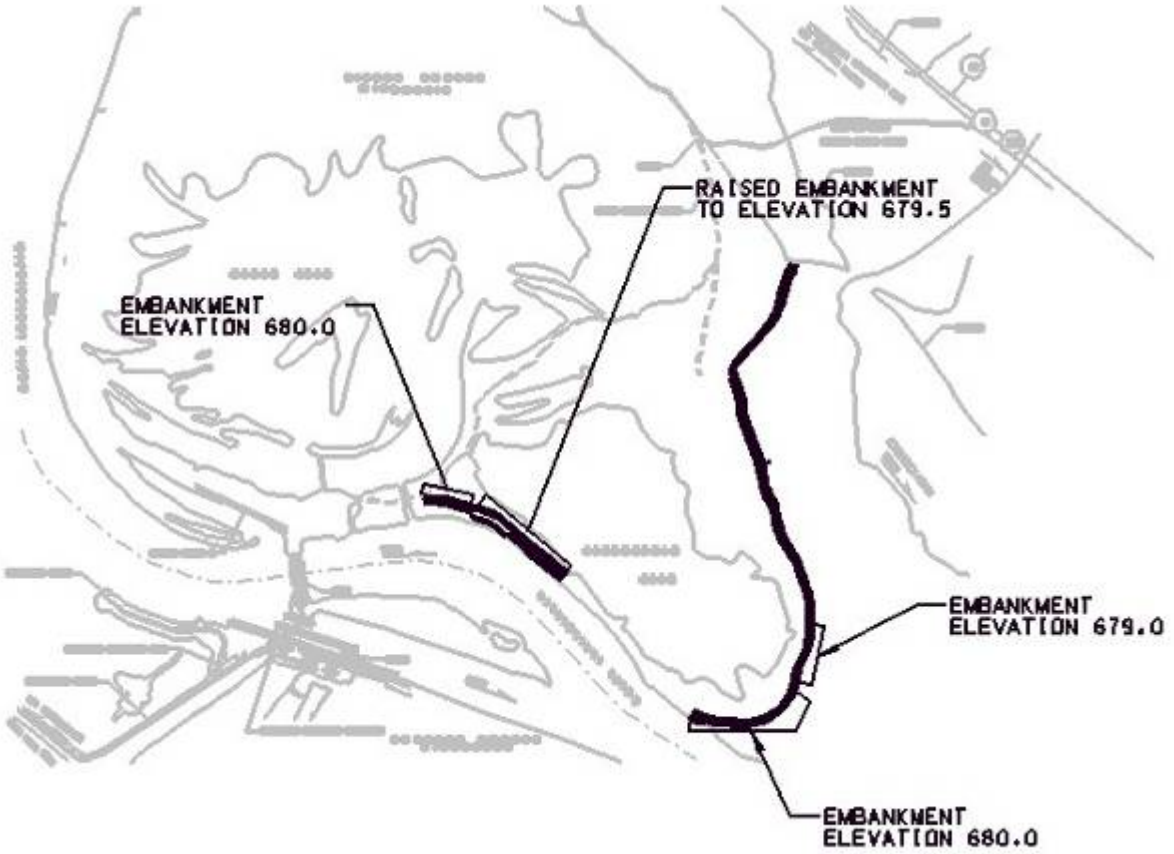


Figure 6-14. Phase 2 construction features.

The estimated cost of embankments construction is $33,644,000. Of that total, the estimated cost of Phase 2 construction, if needed in the future, would be $5,329,000.

6.2.3 Operation and Maintenance

The upper embankment along the access trail and spot dikes would be kept free of woody vegetation by mechanical brushing. On the Marsh Lake and Gantenbein Lake spillways, the planted willows would be mowed about once every 5 years to prevent larger trees from growing in the ACM.

6.2.4 Monitoring

Vegetation on the ACM spillways and in the construction areas would be monitored for several years following construction and replanted as necessary to ensure good cover. The embankments would be inspected annually and after overtopping events.

6.2.5 Decision Process for Initiating Phase 2

If inspections reveal that breaches through the unprotected sections of the lower embankment have occurred, an interagency team with hydraulic engineers, geotechnical engineers, and dam safety engineers from the St. Paul District and the WDNR would inspect the unprotected areas to determine the best course of action (interim repairs, partial or complete Phase 2 project construction).

6.2.6 Phase 2 Construction

Phase 2 construction of the area between the Marsh Lake and Gantenbein Lake spillways would be accessed from the river. The Phase 2 construction of the lower embankment segment from the Gantenbein Lake spillway to the bluff would be accessed from land. The work would take 1 year or less to complete.

6.3 Environmental Mitigation

Environmental mitigation for the proposed project would include avoid and minimize (impacts of construction) measures as described above. Compensatory mitigation for construction impacts on floodplain forest for both Phase 1 and Phase 2 of embankments construction would include fee title purchase of 313 acres of floodplain agricultural land from willing sellers in Pierce County. The land acquisition and floodplain forest restoration on the mitigation land would be done concurrently with project construction. The estimated cost of real estate acquisition for environmental mitigation is $1,512,000. Floodplain forest restoration on the mitigation land is estimated to cost $256,000. The environmental mitigation plan is in Appendix J.

6.4 Design and Construction

6.4.1 Detailed Design

Detailed design and engineering calculations for all the project features will be compiled in a design documentation report. The St. Paul District PDT will coordinate with interested stakeholders on design details of project features during preparation of the design documentation report. Upon completion of the Final General Reevaluation Report and EIS and a positive ROD, plans and specifications will be prepared for use in construction contracts. The St. Paul District PDT will also coordinate preparation of plans and specifications with interested stakeholders.

6.4.2 Construction Sequence

A preliminary project management plan for construction is provided in Appendix M. Construction of the upper embankment access trail and spot dikes would proceed first, with access from land. Sandfill would be placed at the bottom of the bluff on the access trail to protect cultural resources in that area as described in the cultural resources appendix (Appendix D). The spot dikes would be rebuilt sequentially starting from the Wisconsin (Spot dike J) end of the upper embankment. Work on the upper embankment would be accessed from land. Excavated fill material would be removed by truck for disposal at upland sites. New fill material and rock would be brought in by truck. All the construction along the upper embankment should be completed in 1 year, river discharge permitting. If eagles are nesting near the upper embankment, construction work would proceed after the eaglets are fledged in the spring.

The lower embankment Phase 1 work would be conducted starting at the dam, with the raised embankment section. Then, the Marsh Lake and Gantenbein Lake spillways and water control structures would be constructed, with the Marsh Lake spillway being constructed first. All work on the lower embankment would be accessed from the river, including removal of excess material for upland disposal and supply of new fill material, rock riprap, prefabricated parts for the water control structures, and the ACM. This work is expected to take 2 years to complete.

The extended guide wall and the channel modifications would be constructed during the non-navigation season (November through March). Dredging and placement of material, capping with rock, and construction of the extended guide wall would be conducted concurrently. This work is expected to take 2 years to complete.

6.5 Real Estate

Real estate acquisition for the project totals 394.64 acres: 324 acres of land in fee, 3.31 acres of access road easement and 67.33 acres of embankment/channel improvement easement. Within the project construction area are two landowners, with approximately seven landowners among the potential mitigation parcels. Approximately 25.5 acres within the navigational servitude area would be within the work limits of the embankment section of this project. Construction of the extended guide wall would not require acquisition of new real estate interests; this work will be on federally owned lands at Lock and Dam 3 and within the navigation servitude area of the Mississippi River. The details of the real estate required for the project are in Appendix K.

A nonstandard estate is proposed for this project: an embankment/channel improvement easement estate. Remaining real estate interests are proposed for acquisition in standard estates. A map of the real estate requirements is Exhibit 2 in the real estate appendix (Appendix K); the text of the estates is Exhibit 9.

This page intentionally left blank.

CHAPTER 7. ENVIRONMENTAL EFFECTS

7.1 Effects of the Alternative Plans

Effects of the alternative plans on significant resources in the project area were assessed. The following significant infrastructure features in the project area were identified in the project scoping process:

- Lock and Dam 3, the lock, movable dam, embankments
- Navigation channel, channel training structures and navigation aids
- Prairie Island Resort, Casino, and Marina
- Prairie Island Indian Community
- Prairie Island Nuclear Power Plant
- Allen S. King Power Plant (on the St. Croix River)

The following significant ecological and cultural resources are in the project area:

- Scenic beauty of the river
- Native American cultural resources in the floodplain and adjacent Trimbelle River terrace and Prairie Island
- Prairie Island Indian Community
- Floodplain forest and emergent marsh wetlands in the Marsh and Gantenbein Lakes area, Cannon River Bottoms
- Migratory fish, including sturgeon, paddlefish
- Freshwater mussels in the lock and dam 3 tailwater
- Migratory birds that use the Marsh and Gantenbein Lakes area, including neotropical warblers, raptors, colonial-nesting herons and egrets, and waterfowl
- Bald eagles that nest near Lock and dam 3
- Tailwater sport fishery supported by walleye and sauger

An overview of the assessment of the effects of the alternative plans on significant resources is shown in Table 7-1. The no action alternative would result in the future without project condition that is described in section 3.3 above. Both alternative action plans share the same navigation safety improvements, thereby reducing the potential for navigation accidents and the consequences of embankments failure that would occur in the future without-project condition.

Table 7-1. Effects of the alternative plans on significant resources in the Lock and Dam 3 study area, and identification of the environmentally preferred plan.

	Significant Resources in the Study Area Potentially Affected by the Lock and Dam 3 Project												
Potential Effects of the Alternative Plans on Significant Resources **"+" = Positive effect** **"O" = No effect** **"Ø" = Negative effect**	Lock and Dam 3	Navigation channel	Prairie Island Indian Community	Prairie Island Resort, Casino, Marina	Prairie Island Nuclear Power Plant	Allen S. King Power Plant	Floodplain forest, wetlands	Fish community	Sport fishery	Mussel community	Migratory birds	Bald eagles	Scenic beauty of river
No Action	ØØØ	ØØ	O	ØØ	ØØØ	ØØØ	ØØØ	Ø	O	ØØØ	ØØ	O	Ø
N6E2 Extended guide wall with channel modifications + Strengthened embankments	+++	+++	++	++	+++	+++	ØØØ	+	O	ØØ	Ø	O	ØØ
N6E5 Extended guide wall with channel modifications + Strengthened embankments with phased construction	+++	+++	+++	+++	+++	+++	ØØ	+	O	O	Ø	O	Ø

The N9E5 alterative plan is the Environmentally Preferred Plan

The primary difference between the two alternative plans is the embankments design. The N6E2 alternative plan would strengthen the Wisconsin embankments with a different type of lower embankment design (see section 5.3.1 above). The N6E2 alternative plan would have rock-capped spillways between Marsh Lake and Gantenbein Lake and the river. The entire lower embankment would be riprapped, with launchable rock riprap along the area where a high-density and species-rich mussel bed occurs.

The N6E5 alternative plan (see section 5.3.1, above) would strengthen the Wisconsin embankments with phased construction. The Marsh Lake and Gantenbein Lake spillways would be constructed with ACM. The ACM and other areas disturbed by construction would be planted to willows and other native floodplain vegetation. In the N6E5 alternative plan, the first phase of construction would leave the more stable parts of the lower embankment unprotected and largely undisturbed. If breaches occur in the future, the phase 2 construction would be completed.

The environmental and economic adverse effects of embankments failure that would occur in the future without-project condition (section 3.3 above) would be significant. The N6E5 alternative plan, with a more robust embankments design, would reduce the potential and consequences of embankments failure than would the N6E2 plan.

7.1.1 Environmentally Preferred Plan

The N6E5 plan is the plan that would meet the planning objectives and contribute most to NED. On balance, the N6E5 plan would have fewer adverse effects and more positive effects on significant resources in the study area than would the N6E2 plan (Table 7-1). The N6E5 plan is also the environmentally preferred plan. The following discussion provides more detail on these effects.

7.1.2 Effects on Lock and Dam 3

The no-action alternative would continue the high risk of navigation accidents and failure of the Wisconsin embankments, with significant adverse environmental and economic consequences. One of the most expensive consequences of embankments failure would be damage to the gated part of Lock and Dam 3, as nearly occurred during a navigation accident in 1993.

The N6E5 alternative plan would be a more secure embankments design than the N6E2 alternative, with a lower potential for failure and damage to Lock and Dam 3. Construction of both plans could be accomplished while maintaining navigation through Lock and Dam 3.

7.1.3 Effects on the Navigation Channel

The no-action alternative would result in continued risk of navigation accidents and failure of the Wisconsin embankments. The outdraft current across the upper lock approach would continue to make navigation difficult.

Both alternative plans would involve channel modifications, improve navigability in the upper approach to Lock and Dam 3 and equally reduce the risk of navigation accidents.

7.1.4 Effects on the Prairie Island Resort, Casino and Marina

The no-action alternative plan would continue the risk of an accidental drawdown of Pool 3, which would close navigation, force closure of the marina, damage docks and prevent operation of the excursion boat business.

The N6E5 plan would be a more secure embankments design than the N6E2 alternative, with a somewhat lower potential for failure that could result in an accidental drawdown of Pool 3, closure of navigation and damage to docks at the Prairie Island Marina.

7.1.5 Effects on the Prairie Island Indian Community

The no-action alternative plan would not directly affect the Prairie Island Indian Community but would continue the risk of navigation accidents and an accidental drawdown of Pool 3, which would adversely affect Prairie Island Indian Community businesses.

Both alternative plans would reduce the potential for navigation accidents, embankment failure and accidental drawdown of Pool 3, with the N6E5 plan estimated to be more secure than the N6E2 plan. This risk reduction would have a positive effect on the businesses operated by the Prairie Island Indian Community; the Prairie Island Marina and an excursion boat operation. Construction of either plan would not impede navigation into the Prairie Island Marina or otherwise affect lands owned by the Prairie Island Indian Community. Construction on the Wisconsin embankments would create noise through operation of heavy equipment and pile driving. Although the construction noise might be discernable, it should be far enough away from the residential areas on Prairie Island to not be a nuisance.

7.1.6 Effects on Power Plants

The no-action alternative plan would continue the high risk of an accidental drawdown of Pool 3 that would force shutdowns of the power plants.

The N6E5 plan would be a more secure embankments design than the N6E2 alternative, with a lower potential for failure that could result in an accidental drawdown of Pool 3, forcing shut-down of the Prairie Island Nuclear Generating Plant on the Mississippi River and the Allen S. King Generating Plant on the St. Croix River.

Xcel Energy has a National Pollution Discharge Elimination System (NPDES) permit with the Minnesota Pollution Control Agency for thermal (heated water) discharge to the river from the Prairie Island Nuclear Generating Plant. The point of compliance for monitoring the thermal discharge is at Lock and Dam 3. Water passing through the dam becomes thoroughly mixed in the immediate tailwater. The channel modifications and the extended guide wall would change the configuration of the river and the flow pattern upstream of Lock and Dam 3. Numerical hydraulic modeling indicates that the distribution of flow through the four roller gates would not change significantly and should not affect the configuration of the thermal plume from the PINGP at the dam or change the thermal regime in the tailwater. We consulted with Xcel Energy on this and they concur (Patrick Flowers, Xcel Energy, personal communication, October 2006).

7.1.7 Effects on Scenic Beauty of the River

The appearance of the river near Lock and Dam 3 would not change with the no-action alternative plan until an embankments failure occurs. An embankments failure and accidental drawdown of Pool 3 would result in extensive eroded areas in the Gantenbein Lakes area and dewatering of up to 2,500 acres of shallow habitat in Pool 3. An embankments failure could damage the gated part of the dam.

An extended guide wall that is in both alternative plans would not change the appearance of Lock and Dam 3 significantly (see Figures 6-3 and 6-4 in preceding chapter). The channel modifications would all be under water and not be visible.

The N6E2 alternative would have riprap along the entire lower embankment. Trees would have to be removed for construction of the riprap bank and the rock-capped spillways. The rock riprap and the rock-capped spillways along the lower embankment would detract from the scenic beauty of the river.

The N6E5 alternative would disturb less of the lower embankment during the phase 1 construction; leaving more of the trees than the N6E2 plan (see Figures 6-11 and 6-13 in preceding chapter). The ACM spillways and other areas disturbed by construction would be planted with willows and other native floodplain vegetation. After several years, the spillways would be grown in with vegetation and would be less visible from the river. The riprap areas near the dam and the Marsh and Gantenbein Lake outlet structures would be visible from the river. The rebuilt spot dikes would not be noticeable from the river (see Figures 6-9 and 6-10 in the preceding chapter).

7.1.8 Effects on Cultural Resources

The no-action alternative plan would not directly affect cultural resources. Construction would not affect cultural resources sites or change the historic character of Lock and Dam 3. The existing risk of navigation accidents and failure of the Wisconsin embankments would continue, leading over time to a high risk of damage to Lock and Dam 3.

Both alternative plans would not adversely affect cultural resources. A cultural resources site along the access trail to the spot dikes would be protected with fill prior to construction.

Construction to extend the upper guide wall in both alternative plans would have no effect on cultural resources.

Lock and Dam 3 has been determined to be eligible for inclusion on the NRHP. The modifications to the Wisconsin embankments and an extended guide wall would not adversely affect the historic character of Lock and Dam 3.

The Wisconsin SHPO concurs with this assessment (Cultural Resources Appendix D).

7.1.9 Effects on Floodplain Forest and Wetland Habitats

The no-action alternative plan would continue the risk of navigation accidents leading to embankment failure and an accidental drawdown of Pool 3. In the future-without project condition, the embankments would fail and a scour channel would form around Lock and Dam 3, damaging floodplain forest and wetland habitat in the Gantenbein Lakes area (see Figure 3-17 in Chapter 3). An accidental drawdown would adversely affect 2,500 acres of wetland and shallow aquatic habitat in Pool 3.

The alternative plans were assessed for construction effects on habitat using Upper Mississippi River standard land use and land cover types and the limits of construction disturbance from the construction drawings using a geographic information system (GIS). The acreage footprint of the alternative plans on habitat area types is shown in Table 7-2.

Table 7-2. Construction footprint of the Lock and Dam 3 alternative plans on habitat area classes.

Habitat Area Class	Alternative Plan	
	N6E2	N6E5
Developed/agricultural	1.44	1.12
Open water	57.10	65.83
Vegetated aquatic	0.00	0.77
Floodplain forest and brush	31.57	65.70
Floodplain grassland	0.11	1.17
Total area (acres):	90.23	134.59

Although the N6E5 plan would affect a larger area of floodplain forest and open water than the N6E2 plan, the potential for embankment failure and accidental drawdown of Pool 3 would be lower, reducing the potential for adverse environmental impacts in the Gantenbein Lakes area and in Pool 3 over the long term. A breach in the Wisconsin embankments could scour much of Marsh and Gantenbein Lakes and adversely affect about 2,500 acres of Pool 3 (see section 3.2.3 above). Also, the N6E5 plan includes planting native floodplain vegetation on the Marsh and Gantenbein Lake spillways, reducing the impact on habitat as the plants grow to full size.

7.1.10 Effects on Fish Community and the Sport Fishery

The no action plan would not directly affect the sport fishery.

Both alternative action plans would affect the fish community equally. Channel modifications for navigation safety improvement would change deepwater higher velocity sand-bottom habitat into deepwater higher velocity rock-bottom habitat. The increased area of hard substrate should increase the production of fish food organisms like caddisflies. The large rock substrate should provide good habitat for smallmouth bass and catfish.

Both alternative plans include an extended guide wall. Built on pilings, water would pass under the guide wall. The pilings and accumulated woody debris might provide attractive habitat for fish.

The channel modifications are not expected to affect the distribution of flow through the four roller gates at Lock and Dam 3, the pattern of currents in the tailwater, the thermal regime,

or the distribution of fish in the tailwater where most of the sport fishing near Lock and Dam 3 takes place. Construction activities along the lower embankment would limit angler access to the immediate construction areas when towboats and barges were moving to deliver materials.

Construction along the lower embankment would result in temporary and intermittent sediment resuspension over the course of about two years. The existing shoreline and immediate channel border areas in the way of the construction would be modified. The N6E2 plan would have riprap along the length of the lower embankment, providing additional hard substrate for benthic macroinvertebrates and habitat for fish. The N6E5 plan would have riprap near the dam and at the Marsh and Gantenbein Lakes outlet structures, and ACM anchored with riprap underwater along the spillways (Figures 6-9 and 6-11). The ACM and riprap would provide hard substrate for macroinvertebrates and habitat for fish (Way et al. 1995, Anderson et al. 1983). Construction limits would be landward of the existing mussel bed.

Fish access between the Mississippi River and Marsh and Gantenbein Lakes would remain the same as under existing conditions for both alternative plans. The crest of the Gantenbein spillway would be at elevation 675.0, including a 200-foot-long spillway segment with a crest elevation at 674.5 feet msl. The lower-crest spillway segment would be at the same elevation as an existing rock-lined channel in the lower embankment that provides fish access into Gantenbein Lake. The lower spillway section would provide fish access into Gantenbein Lake at the same level of river discharge as presently occurs.

7.1.11 Effects on Mussels

Under the no-action plan, the lower embankment would continue to erode with a high potential for embankment failure. Embankment failure would result in a scour channel around Lock and Dam 3 that would erode away or bury much of the mussel bed in the tailwater.

The N6E2 plan would include riprap along the lower embankment with launchable rock sections along the mussel bed in the tailwater. The launchable rock sections are designed to roll down the underwater slope if the slope erodes landward. This plan could result in more disturbance of the mussel bed in the tailwater than would the N6E5 plan, where less of the lower embankment shoreline would be affected by construction and the alignment of the Marsh Lake and Gantenbein Lake ACM spillways was designed to avoid the mussel bed.

7.1.12 Effects on Migratory Birds

The no action plan would continue the potential for failure of the embankments and damage to Marsh and Gantenbein Lakes, which are used my many migrating birds.

Construction of either alternative plan would result in conversion of floodplain forest habitat into built infrastructure as described in section 5.5.9 above. Neotropical migrating birds like warblers would have less undisturbed floodplain habitat to use on their spring migration northward. The N6E5 alternative plan would have native floodplain vegetation planted on the Marsh and Gantenbein Lake spillways, reducing the adverse effects on habitat. The compensatory mitigation would restore floodplain forest on 313 acres of nearby disturbed floodplain, offsetting the impacts of embankments construction over time.

Embankments construction for either alternative plan would disturb nesting birds in the project area. Construction would not occur in the fall when migrating waterfowl are using Marsh and Gantenbein Lakes.

7.1.13 Effects on Threatened and Endangered Species

Federal and State-listed endangered species that may occur in the project area are described in section 4.1.2 and are listed in Tables 4-2 and 4-3 in Chapter 4.

The bald eagle is a federally-listed threatened species that occurs in the project area. Eagles are relatively common near Lock and Dam 3. They have nested near Lock and Dam 3, and many forage for fish and roost in the trees along the tailwater.

The no-action alternative would not have any significant effects on bald eagles, but the larger roosting trees along the left descending bank of the tailwater would continue to be lost due to bank erosion, wind throw, and beavers, and many could be lost due to scour from an embankment failure.

Construction of either alternative plan could disturb nesting eagles. Work on the upper embankment would be scheduled to avoid the March through May eagle nesting season if eagles are nesting there and construction would not resume until the young are fledged.

Taller trees that provide eagle roosting habitat along the tailwater would be removed to enable construction of the spillways and water control structures.

The N6E2 plan would result in loss of more eagle roosting trees along the tailwater than would the N6E5 selected plan.

Other tall trees that eagles use for roosting line the right descending bank of the tailwater on the island below Lock and Dam 3.

Lampsilis higginsi, Higgin's eye pearlymussel is a federally-listed endangered species. *Lampsilis higginsi* have been cultured and recently re-introduced into lower Pool 4 and upper Pool 3. The Lock and Dam 3 project would not affect these re-introduced endangered mussels.

Under the no-action alternative, an embankments failure and dewatering would scour and dewater Marsh and Gantenbein Lakes, adversely affecting habitat for great egrets and trumpeter swans, which are Wisconsin State-listed threatened and endangered species.

Under the N6E2 alternative, several of the State-listed mussel species could be adversely affected by rock riprap moving downslope onto the mussel bed in the tailwater. The N6E5 selected alternative would avoid impacts on the mussels.

The N6E5 selected alternative would modify deep aquatic habitat above Lock and Dam 3, probably improving habitat conditions for the Wisconsin State-listed fish species goldeye, blue sucker, river redhorse, greater redhorse and paddlefish and Minnesota State-listed fish species blue sucker, shovelnose sturgeon, lake sturgeon and paddlefish.

7.2 Effects on Other Important Resources

7.2.1 Water Quality

Dredging for the channel modifications would be done mechanically during the November through March non-navigation season. The dredge cut area was randomly sampled on August 20 and 21, 2001. Sediment cores were obtained at five locations in the dredge cut (Figure 7-1). Samples consisted of composites of the cores taken from the sediment surface to the bottom elevation of the dredge cut and composites of the first 1 foot of material that would be exposed at the bottom of the dredge cut. Bulk chemistry and particle size gradation analytical work was performed by the Corps of Engineers Chemistry Quality Assurance Laboratory, Omaha, Nebraska.

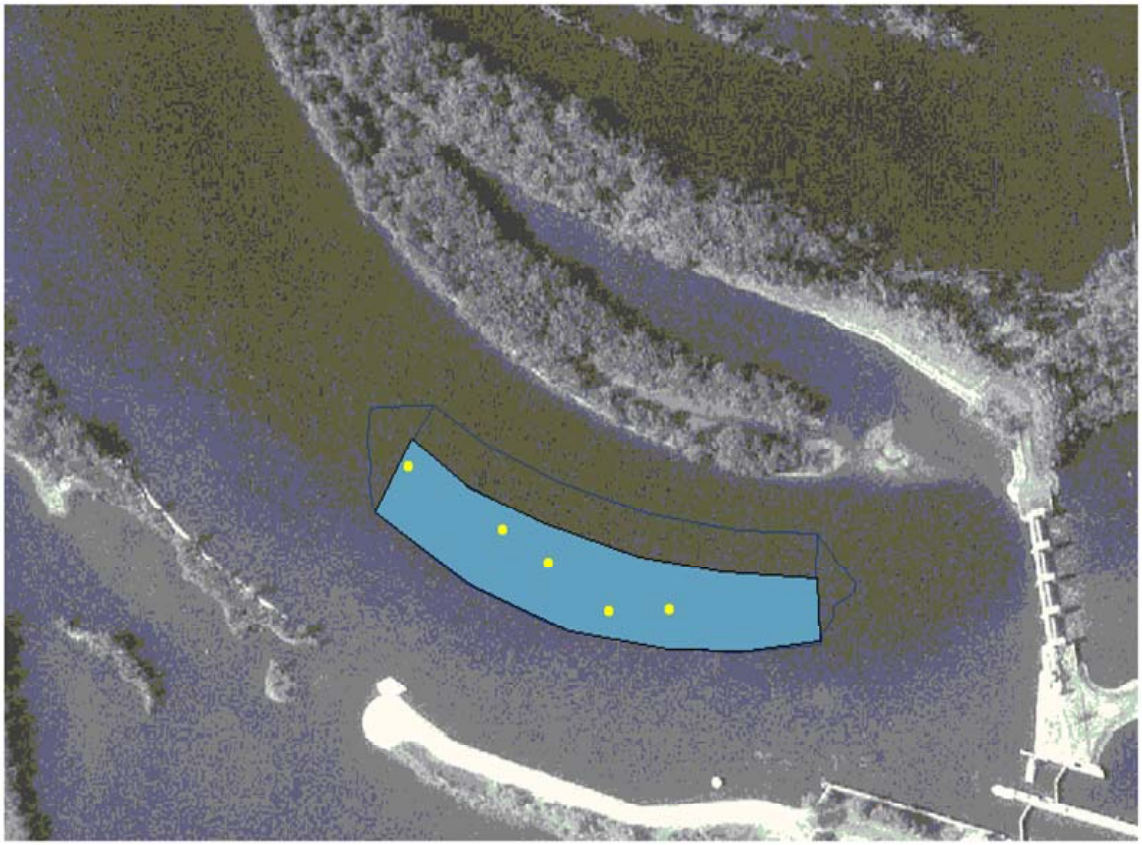


Figure 7-1. Location of randomly located sediment sample cores taken from the proposed dredge cut upstream from Lock and Dam 3, August 20 and 21, 2001. Samples were designated by location numbers 1 through 5 (upstream to downstream). Flow is left to right.

The main channel material to be dredged and placed in the lock approach is primarily medium and fine sand, with a mean of 2.8 percent silt and 4 percent clay (Figure 7-2).

Mechanical dredging would result in temporary and episodic increases in turbidity at the dredge cut and at the placement area in the lock approach. Mechanical dredging, rather than hydraulic dredging, would limit the sediment resuspension.

The suspended sediment concentrations in the downstream mixing zones would not be expected to exceed concentrations that typically occur during higher levels of river discharge. The mixing zones during dredging and material placement would be temporary and localized,

extending toward the gated part of the dam. The mixing zones should cover only a small part of the river cross section. Increased suspended solids concentrations should rapidly return to background levels through settling of sediment particles and dilution. Any remaining increased suspended solids concentrations should return to background levels upon mixing in the immediate tailwater. The dredging and material placement would occur during the non-navigation season (late November through mid-March) when river flow and ambient suspended solids are typically low.

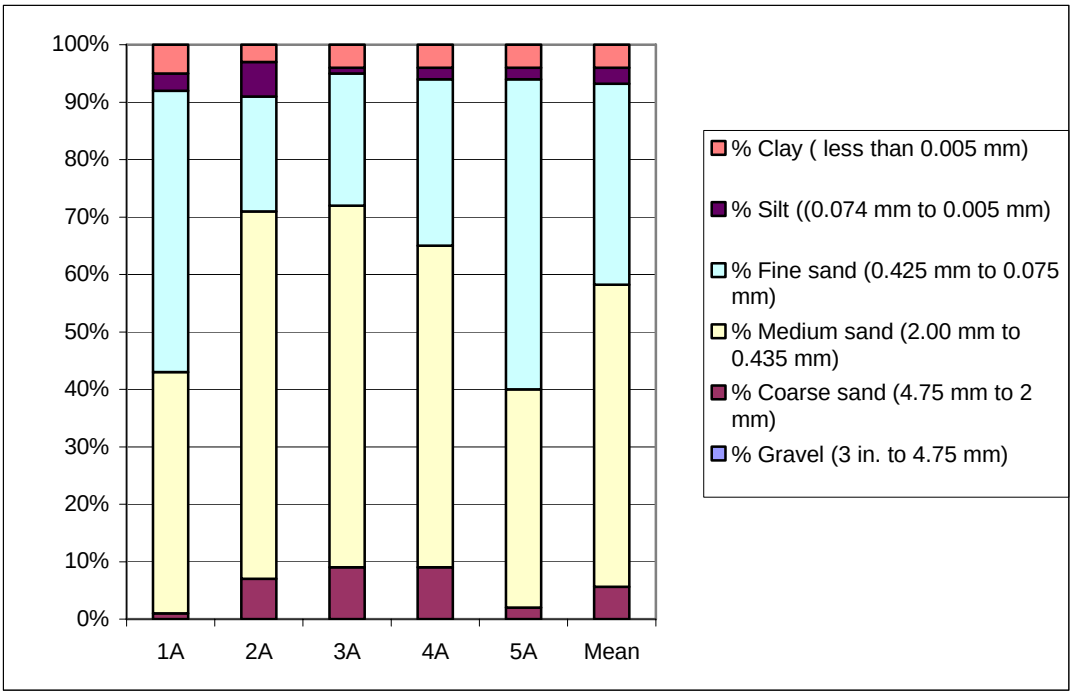


Figure 7-2. Particle size gradation of material to be dredged from the main channel above Lock and Dam 3.

Work along the lower embankment in the tailwater to shape the riverbank prior to ACM and riprap placement would also be done mechanically. This work would result in some temporary and localized sediment resuspension.

Resuspended sediment concentrations immediately near the excavator during dredging, at the placement area in the lock approach and along the lower embankments during shaping of the riverbank would temporarily exceed the Minnesota State water quality standard for turbidity.

Chapter 7050 of MPCA rules identifies the Mississippi River at Lock and Dam 3 as a class 2b, 3B, 4A, 4B, 5, and 6 water for recreational use and for the protection of fish and aquatic life (Judy Mader, MPCA, personal communication 2006). The MPCA water quality standard for turbidity is 25 NTU (nephelometric turbidity units).

The WDNR has designated the Mississippi River near Lock and Dam 3 as a water body for fish and other aquatic life uses capable of supporting a warm-water sport fish community (Rule NR 104). Wisconsin does not have a water quality standard for suspended solids or turbidity for the Mississippi River. Wisconsin Statutes, Section 30.202 Navigable Waters,

Harbors, and Navigation, enables the WDNR to enter into a memorandum of understanding with the U.S. Army Corps of Engineers concerning dredging and material placement in the Mississippi River that can include recommended dredging methods, equipment and placement sites.

The St. Paul District, U.S. Army Corps of Engineers, would apply to the MPCA and the WDNR for State Water Quality Certification under Section 401 of the Clean Water Act. The St. Paul District would also apply (out of comity) for State waters permits for the work. This draft report, EIS, and Section 404(b) Clean Water Act demonstration (Appendix C) will serve as supporting information to those applications.

Bulk chemical analysis of the dredge cut sediments and the sediment that would become exposed at the bottom of the dredge cut revealed no chlorinated hydrocarbons or PCBs (Table 7-3). Metals concentrations were relatively low. Mercury concentrations ranged from1.2 to 27.9 micrograms per kilogram (ug/kg) by dry mass of sediment. Ammonia concentrations ranged from 0.12 to 1.1 milligrams per kilogram (mg/kg) by dry mass of sediment. These bulk chemical concentrations reflect the coarse particle size gradation of the dredge cut sediment and the low organic content, which ranged from 0.16 to 0.68 mg/kg of volatile solids by dry mass of sediment.

The bulk chemical analyses indicate that contaminants mobilization during dredging and material placement should not be a significant problem. The contaminant concentrations in the dredge cut sediments and the sediment that would be exposed after dredging are similar to most other Mississippi River main channel dredge cut sediments in the St. Paul District (Noren 2003).

The St. Paul District has been monitoring sediment physical properties and bulk chemical concentrations in Mississippi River dredge cut sediments since the 1970s. The most recent survey was in the summer of 2002, with 42 samples from 39 locations from Upper St. Anthony Falls to Pool 11 (Noren 2003). We have used Ontario Ministry of the Environment and Energy (OME) sediment quality guidelines (SQG) to characterize contaminant concentrations in Upper Mississippi River sediments. The OME has designated SQG's for the No Effect Level (NEL), Lowest Effect Level (LEL), and Severe Effect Level (SEL) for a number of parameters including mercury. The LEL for mercury is 0.2 mg/kg. All the dredge cut sediments analyzed in 2002 had mercury concentrations of 0.03 mg/kg or less. The non-dredge cut sediment sample from the middle of Lake Pepin had 0.15 mg/kg of mercury. The highest mercury concentration in samples from the proposed dredge cut upstream of Lock and Dam 3 (sample 2A, Table 7-3, p) was 0.028 mg/kg of mercury.

Table 7-3. Results of bulk chemical analyses from a proposed dredge cut upstream of Lock and Dam 3. Core samples taken August 11 and 12, 2001.

			Sampling Locations (A = Dredge cut, B = Sediment at bottom of dredge cut)									
	Units	Parameters	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B
Chlorinated Hydrocarbons	ug/kg	Aldrin	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
	ug/kg	a-BHC	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
	ug/kg	b-BHC	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
	ug/kg	d-BHC	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	ug/kg	g-BHC (lindane)	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
	ug/kg	4,4'-DDD	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	ug/kg	4,4'-DDE	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
	ug/kg	4,4'-DDT	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
	ug/kg	Dieldrin	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
	ug/kg	a-Endosulfan	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
	ug/kg	b-Endosulfan	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
	ug/kg	Endosulfansulfate	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	ug/kg	Endrin	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
	ug/kg	Endrinaldehyde	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
	ug/kg	Endrinketone	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	ug/kg	Heptachlor	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
	ug/kg	Heptachlorepoxide	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
	ug/kg	Methoxychlor	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
	ug/kg	Toxaphene	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
	ug/kg	Oxychlordane	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	ug/kg	g-Chlorodane	< 0.5	< 0.5	< 0.5	< 0.5	1.8	1.3	2.2	< 0.5	< 0.5	0.8
	ug/kg	a-Chlorodane	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5

Table 7-3 (continued). Results of bulk chemical analyses from a proposed dredge cut upstream of Lock and Dam 3. Core samples taken August 11 and 12, 2001.

			Sampling Locations (A = Dredge cut, B = Sediment at bottom of dredge cut)									
	Units	Parameters	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B
Metals	mg/kg	Cd (cadmium)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.11	< 0.1	< 0.1	< 0.1
	mg/kg	Cr (chromium)	6.3	9.91	4.3	6.56	8.82	6.27	6.83	5.8	6.86	5.3
	mg/kg	Cu (copper)	2.2	2.2	1.7	1.9	2.2	1.7	1.8	1.8	2	1.6
	mg/kg	Mn (manganese)	339	508	214	355	286	229	343	311	196	164
	mg/kg	Ni (nickel)	4.5	7.3	5.0	6.6	7.1	5.8	5.7	6	5.1	5
	mg/kg	Pb (lead)	2.7	2.1	1.9	1.4	2.6	2.1	2.6	1.4	3.3	2.7
	mg/kg	Zn (zinc)	13.9	14.3	12.1	10.4	17.0	13.7	14.1	9.52	14.9	13.2
	ug/kg	Hg (mercury)	15.4	5.8	27.9	1.2	8.7	7.5	6.1	0.9	23.2	12.7
	mg/kg	As (arsenic)	1.03	1.07	1.48	1.14	1.01	1.11	1.1	1	1.06	1.17
PCB's	ug/kg	trans-Nonachlor	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	ug/kg	cis-Nonachlor	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	ug/kg	Aroclor-1232	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4
	ug/kg	Aroclor-1242	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4
	ug/kg	Aroclor-1248	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4
	ug/kg	Aroclor-1254	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4
	ug/kg	Aroclor-1260	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4
	ug/kg	Total PCB's	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4
MISC	mg/kg	Total Organic Carb	10000	6600	12000	5000	8600	6100	3600	4900	8100	9500
	mg/kg	Cyanide, Total	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	mg/kg	Ammonia	0.38	0.58	0.77	0.32	0.25	0.12	0.94	0.23	1.1	0.51
	%	Total Solids	84.5	81.2	80.2	82.8	84.7	81.8	83.1	84.5	80.8	79.5
	%	Volatile Solids	0.26	0.16	0.68	0.17	0.21	0.18	0.20	0.16	0.27	0.21

7.2.2 Noise

Construction activities would generate noise from trucks hauling materials, excavators, driving sheet pile and pilings, and towboats pushing barges. Trucks hauling materials and equipment along 290th Avenue in Wisconsin would generate noise in passing a number of farms and residences. Rock from local quarries would be used for construction, generating noise from blasting and transporting rock from those areas. Lock and Dam 3 is distant from residential areas. Construction noise would disturb wildlife in the Marsh and Gantenbein Lakes area. The construction activity would take place over a 2- to 3-year period.

7.2.3 Air Pollution

Construction machinery and towboats would generate air pollution from diesel engine exhaust.

7.2.4 Changes to Land Cover and Terrestrial Habitats

Construction of the proposed plan would affect about 65.7 acres of floodplain forest and brush, mostly along the lower embankment (Table 7-4). Floodplain forest trees would have to be cleared for constructing the raised embankment near the dam, the Marsh Lake and Gantenbein Lake spillways, construction yard areas, and a segment of access trail around the south end of Gantenbein Lake. Boundaries of the construction areas would be further coordinated with the landowners and the WDNR during development of the design documentation report and would be incorporated into plans and specifications for the work.

The ACM spillways would be planted with willows and other native floodplain plants. Other areas disturbed by construction and not part of the access trails would also be planted to native floodplain trees and forbs.

Compensatory environmental mitigation for the construction impacts would be done concurrently with construction. 313 acres of floodplain agricultural land would be purchased in fee from willing sellers in nearby Pierce County. These areas would be planted with native floodplain trees. The land would be restored from cleared agricultural land to floodplain forest. See the environmental mitigation plan (Appendix J).

Table 7- 4. Area (acres) of land cover types affected by the proposed navigation safety and embankments project at Lock and Dam 3.

Developed/agricultural	1.12
Open water	65.83
Vegetated aquatic	0.77
Floodplain forest and brush	65.70
Floodplain grassland	1.17

7.2.5 Changes to Aquatic Habitats

The extended guide wall and channel modifications would have impacts on 47 acres of deep main channel habitat. The affected area is deep channel habitat with relatively high current velocity and a sand bottom. Dredging would deepen about 30 acres of the main channel in the approach to the dam, and about 17 acres in the lock approach would be filled and capped with rock. All macroinvertebrates in the area would be killed by the dredging and material placement. Sand dune structure on the riverbed in the dredge cut would rapidly re-establish, and the limited main channel sand macroinvertebrate community would recolonize within the growing season following dredging. Macroinvertebrates would rapidly colonize the rock substrate placed in the lock approach area. The large rocks in the area would provide sheltered habitat for fish. Navigation traffic in the lock approach area would limit use of the area by fish during the navigation season.

A berm connecting the end of the guide wall with the Minnesota riverbank would fill approximately 1.5 acres. The berm is needed to prevent woody debris from accumulating on the landward side of the extended guide wall. Approximately 0.5 acre of this berm would be emergent, converting aquatic habitat to terrestrial. The side slopes of the berm would be armored with rock. The emergent parts of the berm not armored with rock would be initially planted with grass but would eventually grow up with willows and cottonwood trees.

The pattern of current velocity upstream of Lock and Dam 3 would be changed by the channel modifications, directing more flow toward the gated part of the dam and reducing velocities and the outdraft current in the lock approach. Hydraulic modeling indicates that the distribution of flow through the dam gates and the flow pattern in the tailwater is not expected to change.

The net effects on channel habitat would be to convert 17 acres of deep channel high current velocity sand bottom habitat to deep channel rock bottom habitat with somewhat lower current velocities.

The extended guide wall on pilings would provide a sheltered channel border area for fish. The pilings would probably catch woody debris, creating hard substrate for filter-feeding macroinvertebrates and habitat for fish.

Approximately 10.8 acres of channel border aquatic habitat along the lower embankment would be disturbed by the phase 1 embankment construction for grading the bank and placing the ACM and rock at the toe of the ACM (see Figure 6-5 in Chapter 6). This area would be converted from eroding riverbank with tree roots and scattered rock to ACM with rock riprap at the toe. The riverbanks in the vicinity of the Marsh Lake and Gantenbein Lake outlet structures would be rock riprap. The construction footprint would be landward of the existing mussel bed. The phase 2 construction along the lower embankment could affect an additional 8.0 acres of channel border aquatic habitat. These impacts of construction were considered in calculating out-of-kind compensatory mitigation, and resulted in including 93 acres of floodplain forest restoration in the mitigation plan (Environmental Mitigation Appendix J).

The hydrologic regime of Marsh and Gantenbein Lakes would not change. The new water control structures would allow maintenance of the same range of water levels as has been historically managed by the landowners. Fish access to the lakes would continue to be available during periods of higher river discharge through the lower embankment areas left undisturbed in phase 1 construction, through the water control structures and over the spillways.

7.2.6 Effects on Aquatic Biota

The 17 acres of rock substrate in the lock approach would provide hard substrate for crayfish and a variety of filter-feeding macroinvertebrates like Hydropsychid caddisflies, which are important fish food organisms. Production of macroinvertebrates in the area is expected to increase. The rock substrate placed in the lock approach would provide microhabitat shelter from the current for fish like darters, rock bass and smallmouth bass.

Extensive mussel surveys in the project area above the dam found very few native mussels.

Construction of the channel modifications and the extended guide wall would be done during the late November to mid-March nonnavigation season. This seasonal timing of construction should limit adverse impacts on walleyes and sauger spawning in the tailwater.

Bank shaping and placement of ACM and rock along the lower embankment would disrupt aquatic life in that area. Work would be done landward of the mussel bed in the tailwater. Macroinvertebrates should rapidly colonize the hard substrates following construction.

The project would reduce the potential for navigation accidents and the adverse environmental consequences of accidental spills and pool drawdown on aquatic biota.

7.2.7 Effects on Wildlife

Construction along the upper and lower embankment would disturb wildlife and modify floodplain forest habitat as described above. A line of larger trees used for perching by eagles and ospreys would be removed to enable construction of the Marsh Lake and Gantenbein Lake spillways. Wildlife use of the lower embankment would be disrupted during construction and would be limited for one or two years following construction until the planted vegetation becomes established.

Turtles and amphibians would be able to travel across the ACM spillways between the floodplain lakes and the river.

Construction along the spot dikes on the upper embankment would be timed to avoid disturbing eagles if they are nesting nearby. Similarly, construction along the lower embankment would be seasonally conducted to avoid disturbing migrating waterfowl on Marsh and Gantenbein Lakes.

The project would reduce the potential for navigation accidents and the adverse environmental consequences of accidental spills and pool drawdown on wildlife.

7.2.8 Effects on Recreational Use

The project should have limited effects on recreational use. The extended guide wall and channel modifications would be constructed during the non-navigation season and would not impose any additional navigation safety problems for recreational boaters.

The project should not significantly affect sport fishing opportunity in the tailwater area. Population levels of walleye and sauger and sport fishing opportunity should not be affected by the changes in the channel border area due to the embankments construction. Construction along the lower embankment would temporarily interfere to some degree with sport fishing in the immediate area of work.

Land ownership and public access in the vicinity of Lock and Dam 3 would not change. The access trail along the upper embankment would be maintained for maintenance work and inspections by the Corps of Engineers. The trail would remain gated against public motorized access. Public walk-in use on the federally-owned upper embankment would continue. The lower embankment would remain in private ownership.

At least 313 acres of environmental mitigation land would be acquired by the Corps of Engineers in nearby Pierce County. This land would be restored to floodplain forest habitat, would be managed for wildlife, and would be available for non-motorized public use.

7.2.9 Effects on Scenic Qualities

The appearance of the upper embankment and spot dikes from the river would not change.

Construction of the raised embankment near the dam, removal of trees along the lower embankment, and construction of the Marsh Lake and Gantenbein Lake spillways and water control structures would change the appearance of the lower embankment from a fairly natural-looking eroding riverbank to a more engineered appearance. Growth of planted willows and other vegetation along the ACM spillways would improve the appearance and hide the structures to some degree.

The extended guide wall would be noticeable to those familiar with Lock and Dam 3, but it would not be out of character with the rest of the lock and dam structure. The channel modifications would be under water and not visible.

7.2.10 Effects on Cultural Resources

A total of five cultural resource sites are in or near the project area. Three cultural resource sites that are adjacent to the project area include Archaeological Site 47PI185 and four historic wing dams upstream of Lock and Dam 3. Although Site 47PI185, once consisting of at least six mounds, is indicated by Wisconsin SHPO records as being in the project area, this mound group was restricted to the terrace immediately north of the project area and would not be affected by the project.

The historic wing dams, considered eligible for listing on the NRHP, are south of the spot dike repair section along the main channel and would be outside the construction area for the new spot dikes, which would be set inland from the main channel.

In 1986, Lock and Dam 3 was determined eligible for listing on the NRHP. As stipulated in a 1987 programmatic agreement (see the cultural resources appendix (Appendix D)), SHPO coordination is not necessary because the proposed embankment repairs would be conducted within previously disturbed areas along the embankment structure and would have no adverse effects on the lock and dam.

Two cultural resource sites are within the embankments portion of the project's area of potential effect: Precontact Archaeological Sites 47PI448 and 47PI559. Site 47PI448, eligible for listing on the NRHP, is located on a low terrace near the base of the Mero Terrace and is bisected by the northern reach of the lower embankment access road. This site contains, at a minimum, a variety of Woodland (c. 100 B.C.-1000 A.D.) ceramics and lithic artifacts, as well as heat-altered rock and a few faunal remains with intact stratigraphy. The site is buried by approximately 60 centimeters (about 2 feet) of postsettlement alluvium and road gravels.

Archaeological Site 47PI559, also eligible for listing on the NRHP, is located near the base of a terrace on the former Trimbelle River delta along the northern reach of the upper embankment access road. Cultural materials include chipped and ground stone debitage (including exotic examples of Knife River Flint and Obsidian), ceramics, heat-altered rock, charcoal, and some faunal specimens, recovered from stratigraphically intact contexts. Identified cultural components, based on the ceramic assemblage, include Middle and Late Woodland materials (c. 100 B.C.-700 A.D.). Artifacts at this site are closer to the modern land surface, buried by only a thin (about 5 to 10 centimeters) veneer of organic and sandy sediments. A report with more detail about this site will be included as a cultural resources appendix to the Final General Reevaluation Report and EIS.

In general, compaction studies suggest that artifacts within approximately 25 to 30 centimeters below ground surface are susceptible to negative impacts from differential strain. Below these depths (more than 9 inches), the strain is typically reduced or absent, depending on various soil and artifact characteristics. Site 47PI448 is already buried by approximately 2 feet of recent sediments, and the lower embankment access road will only be used by light duty vehicles. Thus, the project would have no adverse impacts on Site 47PI448. Because the upper embankment access road would be used as a heavy haul road, the Corps intends to improve the portion of the access road situated over Site 47PI559 by placing filter fabric along the road alignment and building up the roadbed with a minimum of 2 feet of fill. Also, archaeological monitoring would take place during construction, and, if possible, construction activities would take place during winter. With these measures in place, the Corps believes that no adverse impacts would occur at Site 47PI559 during the embankment repair project.

7.2.11 Economic Effects

Construction of the project would contribute to the regional economy through construction employment, meals and lodging for construction workers, and purchase of fuel and materials.

The project should have no adverse effects on the Prairie Island Indian Community, Casino, Campground, or Marina. The project would reduce the potential for an accidental drawdown of Pool 3 that would force shutdown of the marina and damage dock facilities.

Completion of the project would provide national economic benefit (see section 5.4 in Chapter 5 and the economics appendix (Appendix E)) by reducing the risk of the adverse

economic consequences of navigation accidents, embankment failures and accidental drawdown of Pool 3.

7.3 Cumulative Effects

Cumulative effects are the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes the actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

The cumulative effects on natural resources of past actions in the Lock and Dam 3 study area have been significant. Social, cultural, natural, and tribal resources have been changed significantly as a result of past actions. Wetlands and floodplain forest have been altered, the Mississippi River has been impounded, channelized, and regulated for navigation, prairie vegetation has been lost, cultural sites have been destroyed, and the economy of the area has changed markedly in the last two centuries. The effects of future actions when added to these historic effects could be significant.

For this Integrated General Reevaluation Report and EIS, the incremental effects of the navigation safety and embankments project are the features to be addressed for cumulative impacts. The cumulative and incremental effects of the navigation safety and embankments project would be significant. Physical and biological changes imposed by the project would add to the existing effects of impoundment, river regulation, navigation, industrial and recreational uses of the river. These incremental effects and environmental mitigation measures are described above in this Integrated General Reevaluation Report and EIS.

The future without-project condition is described in Section 3.3 above. Some reasonably foreseeable actions and related ecosystem conditions that are either being planned or considered by other agencies or groups in the project area include the following:

- Continued operation and maintenance of the navigation project
- Continued commercial and recreational boating traffic
- Continued operation of the Prairie Island Nuclear Power Plant
- Continued operation of the Prairie Island Resort, Casino and Marina
- Continued use and management of the Gantenbein Lakes as a wildlife and hunting area
- Continued use and management of the Cannon River Bottoms as a wildlife and hunting area
- Ecosystem restoration projects through the existing Environmental Management Program for the UMRS and the (yet to be authorized) Navigation and Ecosystem Sustainability Program.
- Continued use and management of wildlife management areas by the WDNR, the MDNR and the Prairie Island Indian Community
- Improving water quality conditions in the Mississippi River through watershed and water quality management efforts in the basin to reduce nutrient and sediment loading
- Continued management of the popular walleye and sauger fishery in Pool 4 by the MDNR and the WDNR
- Potential problems with fish populations from emerging contaminants like endocrine-disrupting compounds

- Declining contaminant concentrations like PCBs in river sediments and fish
- Continued residential and commercial development in the area
- Increased recreational boating traffic on the Mississippi River

Marsh and Gantenbein Lakes are natural floodplain lakes that were impounded for use as a hunting area prior to construction of Lock and Dam 3 through construction of low embankments and small water control structures. Embankments construction for the Lock and Dam 3 project would directly affect 65.7 acres of floodplain forest and brush and 18.8 acres of channel border aquatic habitat that was historically disturbed in the 1930s when Lock and Dam 3 was built. Most of the upper embankment and the spot dikes areas have been maintained by removing woody vegetation and by armoring the river bank with riprap. Most of the floodplain area originally disturbed by project construction along the lower embankment has since grown into mature floodplain forest. Much of the original lower embankment area along the river was eroded away over time by river currents and wave action, resulting in the loss of many trees. Some of the floodplain forest area near the dam and at the lower end of Gantenbein Lake was further disturbed by erosion and emergency repairs during the 1993 navigation accident. This loss of floodplain forest, in combination with the effects of invasion by reed canary grass, death of mature silver maples, loss of American elm trees to Dutch elm disease, and poor recruitment of floodplain trees in the project area, is significant. Restoration of 313 acres of floodplain forest in southern Pierce County would, in time, provide compensatory mitigation for disturbance of floodplain forest and channel border aquatic habitat during embankments construction.

The embankments construction would not significantly change the appearance of the river along the upper embankments. The increased amount of riprap and the ACM spillways on the lower embankment would add to the amount of engineered river bank in the project area. The ACM spillways would grow in with vegetation in time, and would not be as visible during the growing season.

Construction of the lower embankments would further alter a historically disturbed channel border area, changing sand bottom channel border habitat with an eroding bank into engineered ACM spillways with riprap at the toe and segments of riprap bank near the dam and at the water control structures. These changes to channel border aquatic habitat should not decrease production of aquatic life in the area, but would change the quality of habitat by increasing the amount of hard substrate and making a more regular underwater slope. Installation of anchored large woody debris under water on the ACM spillways would provide some additional habitat diversity.

The incremental effects of the channel modifications and construction of an extended guide wall when added to the other historic changes in the project would not be significantly adverse. The dredging and material placement for the channel modifications would have temporary and intermittent adverse effects on water quality. Mobilization of sediment during the dredging and material placement would not be significant given the much higher rates of ambient sediment transport. Placement of rock over 17 acres of river bed in the lock approach area would result in a net increase in production of aquatic macroinvertebrates and more diverse habitat for fish. The extended guide wall on pilings and accumulated woody debris in between the pilings would provide a sheltered channel border area for fish. The navigation safety improvements would not significantly alter the appearance of the river above Lock and Dam 3.

Strengthening the Wisconsin embankments and improving navigation safety at Lock and Dam 3 would reduce the risk of navigation accidents, cargo spills, damage to vessels and to

Lock and Dam 3, injury and loss of life of towboat crews, embankments failure and the ecological and economic adverse impacts of an accidental drawdown of Pool 3.

The incremental effects of the project when considered by themselves or in conjunction with other reasonably foreseeable actions are significant but do not result in any additional impacts above those described in this Integrated General Reevaluation Report and EIS. The proposed environmental mitigation and monitoring activities are reasonable measures that should be included to minimize the effects of the construction of the navigation safety and embankments project at Lock and Dam 3.

7.4 Irretrievable Commitments of Resources by Proposed Action

The habitat and land cover changes that would occur are described above. The river channel would be modified to reduce the outdraft current and should remain in that geometry for the foreseeable future. Approximately 102,000 cy of rock would be removed from nearby quarries and placed in the river as part of the channel modifications. Nonrenewable petroleum fuel would be used to power trucks, excavators, towboats, and other equipment used in the construction.

7.5 Mitigation for Impacts of Proposed Action

Environmental mitigation for impacts of the proposed project is described in section 6.1.3 above and in the environmental mitigation plan (Environmental Mitigation Plan Appendix J).

7.6 Potential Conflicts Arising from Proposed Action

Conflict about the planning process for an earlier proposed embankments project at Lock and Dam 3 existed prior to 2002 when this general reevaluation study began. The St. Paul District has attempted to conduct this planning process to address the related navigation safety and embankment problems together and to involve stakeholders in the planning process. We are not aware of any potential conflicts that may arise from the proposed action.

This page intentionally left blank.

CHAPTER 8. ENVIRONMENTAL COMPLIANCE AND REVIEW

8.1 Applicable Environmental Laws and Executive Orders

The St. Paul District, U.S. Army Corps of Engineers, has conducted this general reevaluation and NEPA process in accordance with Corps of Engineers planning guidance (ER 1105-2-100) and requirements of applicable laws and regulations (Table 8-1). We conducted a scoping process with input from stakeholders (see section 2.5). We have assessed the environmental effects of the alternative plans and the proposed action on the environment (Table 8-2). Specific actions would be implemented to protect cultural resources, significant environmental resources, and threatened or endangered species.

Table 8-1. Federal environmental laws and executive orders applicable to the Lock and Dam 3 project

National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347)
Protection and Enhancement of Environmental Quality (Executive Order 11514)
Administrative Procedures Act (5 U.S.C. 511-599)
Clean Water Act of 1977 (33 U.S.C. 1251 *et seq.*) (Sections 401 and 404), as amended
Clean Air Act (42 U.S.C. 7401-7671g)
Noise Control Act of 1972, as amended (42 U.S.C. 4901 et seq.)
National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 et seq.)
Archaeological Resources Protection Act, as amended (16 U.S.C. 470aa et seq.)
Abandoned Shipwreck Act of 1987 (43 U.S.C. 2101-2106)
American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996)
Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 et seq.)
Antiquities Act (16 U.S.C. 431 et seq.)
Indian Sacred Sites (Executive Order 13007)
Consultation and Coordination with Indian Tribal Governments (Executive Order 13175)
Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661, 48 Stat. 401)
Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.)
Migratory Bird Treaty Act, as amended (16 U.S.C. 703 et seq.)
Bald and Golden Eagle Protection Act, as amended (16 U.S.C. 668-668d)
Wild and Scenic Rivers Act of 1968, as amended
Protection of Wetlands (Executive Order 11990)
Invasive Species (Executive Order 13112)
Responsibilities of Federal Agencies to Protect Migratory Birds (Executive Order 13186)
Rivers and Harbors Acts (33 U.S.C. 401, 403, 407)
Federal Water Project Recreational Act (16 U.S.C. 460l-12 to 22, 662)
Federal Farmland Protection Policy Act (Subtitle I of Title XV, Section 1539-1549 Public Law 97-98)
Executive Order 12898 Environmental Justice

Table 8-2. Effects of the proposed action on natural resources and historic properties, as well as the associated regulatory authorities.

Types of Resources	Regulatory Authorities	Level of Effect
Water Quality	Clean Water Act Safe Drinking Water Act	Temporary and localized increases in suspended solids due to dredging, bank shaping and material placement. No significant mobilization of contaminants from sediment.
Control of Pollution	Clean Air Act Noise Control Act	Temporary and localized noise and exhaust smoke from construction. Construction would take place in an area distant from residential areas.
Cultural Resources	National Historic Preservation Act Archaeological Resources Protection Act Abandoned Shipwreck Act American Indian Religious Freedom Act Native American Graves Protection and Repatriation Act Antiquities Act Indian Sacred Sites (Executive Order 13007) Consultation and Coordination with Indian Tribal Governments (Executive Order 13175)	Effects assessed through on-site survey and coordination with Wisconsin SHPO. Met with Prairie Island Indian Community to discuss project. No adverse effects are anticipated.
Ecology and Habitat	Fish and Wildlife Coordination Act Endangered Species Act Migratory Bird Treaty Act Bald and Golden Eagle Protection Act National Wildlife Refuge System Administration Act Wild and Scenic Rivers Act Protection of Wetlands (Executive Order 11990) Invasive Species (Executive Order 13112) Responsibilities of Federal Agencies to Protect Migratory Birds (Executive Order 13186)	Assessed effects of construction on floodplain forest and other habitats. Developed environmental mitigation plan. Would implement a number of avoid and minimize measures. Coordinated with U.S. Fish and Wildlife Service about threatened and endangered species.
Use of Land and Water Bodies	Rivers and Harbors Act Flood Plain Management (Executive Order 11988) Federal Water Project Recreational Act	Project has been planned and designed to improve navigation safety. Assessed impacts of proposed action on river and navigation. Will implement a number of measures to avoid disrupting commercial navigation. Planned and designed project to protect navigation safety for recreational boaters.

8.2 Comments on the Final General Reevaluation Report and EIS

We request and welcome written comments on this final integrated general reevaluation report and rIS. **Please provide written comments by January 12, 2007,** to the St. Paul District, U.S. Army Corps of Engineers, ATTN: Mr. Daniel Wilcox, CEMVP-PM-E, 190 Fifth Street East, Suite 401, St. Paul, Minnesota 55101, email: Daniel.B.Wilcox@usace.army.mil.

Comments from agencies and the public will be compiled and, along with written responses, will be included with the final report and EIS for transmittal to the Commander, Mississippi Valley Division for a Record of Decision.

8.3 Required Coordination

Clean Water Act

The WDNR, MnDNR, and MPCA actively participated in the planning process for this project. The effects of the proposed project were assessed and documented in this EIS and in the Section 404(B) Clean Water Act Evaluation Appendix C. Application will be made to the WDNR and MPCA for State water quality certification under Section 401 of the Clean Water Act and, out of comity, for state waters permits.

Fish and Wildlife Coordination Act, Endangered Species Act

The WDNR, MnDNR and the USFWS actively participated in the planning process for this project. Coordination was accomplished with the USFWS about endangered and threatened species (Appendix A Coordination Correspondence). The U.S. Department of the Interior provided comments on the draft General Reevaluation Report and EIS (Chapter 13 below). USFWS has indicated that those Department of the Interior comments are the Fish and Wildlife Coordination Act letter for the Lock and Dam 3 project (Coordination Correspondence Appendix A).

Cultural Resources

The potential effects of the proposed project on cultural resources were assessed (see section 7.2.10 above). The Wisconsin SHPO has concurred with our finding that the project would not adversely affect cultural resources (Coordination Correspondence Appendix A).

Farmland Protection

The Farmland Protection Policy Act is intended to minimize the impact Federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. It assures that—to the extent possible—Federal programs are administered to be compatible with State and local units of government and private programs and policies to protect farmland. Floodplain agricultural land in Pierce County would be acquired for environmental mitigation.

The St. Paul District will coordinate this real estate acquisition with the Pierce County office of the Natural Resources Conservation Service of the U.S. Department of Agriculture.

Environmental Justice

Compliance with Executive Order 12898 Environmental Justice requires consideration of social equity issues, particularly any potential disproportionate impacts to minority or low income groups. There has been continuing coordination with the Prairie Island Indian Community Department of Natural Resources and the Tribal Council about the Lock and Dam 3 project.

8.4 Statement of Recipients

This draft report and EIS has been provided via computer .ftp server and by hard copy with the appendixes on computer disc to stakeholders and agencies, organizations and public study participants. A list of recipients of this report is included in Appendix A. Paper copies of the report are available for review at the Red Wing Public Library and at the St. Paul District office. The entire report and appendixes are available to download as .pdf files from the St. Paul District anonymous .ftp server at: ftp://ftp.mvp.usace.army.mil/ in directory LD3 GRR+EIS and from the St. Paul District Internet site at: http://www.mvp.usace.army.mil/

CHAPTER 9. COST SHARING

Cost of this general reevaluation study, construction and mitigation for this project are be 100-percent Federal, paid 50 percent each from the Inland Waterways Trust Fund and the general fund of the U.S. Treasury.

This page intentionally left blank.

CHAPTER 10. CONCLUSIONS AND RECOMMENDATIONS

10. 1 Conclusions

The St. Paul District, U.S. Army Corps of Engineers, prepared this final integrated general reevaluation report and EIS about navigation safety and the Wisconsin embankments at Lock and Dam 3 on the Mississippi River to document the planning process, alternatives evaluated and findings.

The related navigation safety and embankment problems at Lock and Dam 3 pose significant risks to commercial navigation, the river environment and the economy. A wide range of alternative measures was examined. A risk and benefit-cost assessment was used to evaluate alternative plans. An effective combination plan to improve navigation safety and strengthen the Wisconsin embankments has been selected as the recommended plan.

The recommended plan is to improve navigation safety through channel modifications and an extended guide wall and to strengthen the Wisconsin embankments with phased construction.

This report is a final integrated general reevaluation report and EIS. At this stage, we recommend that the public, stakeholder agencies and organizations review this final report and EIS and provide written comments by **January 12, 2007**, to the St. Paul District, U.S. Army Corps of Engineers, ATTN: Mr. Daniel Wilcox, CEMVP-PM-E, 190 Fifth Street East, Suite 401, St. Paul, Minnesota 55101or email: Daniel.B.Wilcox@usace.army.mil.

The St. Paul District will compile the comments, prepare written responses, and transmit them along with the final General Reevaluation Report and EIS to the Mississippi Valley Division Commander, U.S. Army Corps of Engineers in Vicksburg, Mississippi. The Division Commander will take the recommendations in this report under consideration and will issue a Record of Decision about the Lock and Dam 3 Navigation Safety and Embankments Project.

10.2 Recommendation

We will recommend that the Final Integrated General Reevaluation Report and EIS be approved and that the selected plan be implemented. The Corps of Engineers would administer the plan in collaboration with stakeholders involved in management of the Upper Mississippi River 9-Foot Channel Navigation Project. The combined navigation safety and embankments plan will seek funding for the following actions:

Extended Guide Wall and Channel Modifications

The existing landward guide wall on the upstream side of the lock would be extended 862 feet. A pile-supported concrete wall would be constructed with a continuous concrete rubbing surface extending 3 feet below normal pool level; a concrete panel would hang 8 feet below that to control crosscurrents along the wall. The guide wall would have bollards to tie off barges, lights, signage and access. At the upstream end of the wall, a 50-foot-diameter concrete filled steel sheet pile cell would protect the end of the wall from direct collisions. The sheet pile cell would have a navigation light, power, access, and signage. An earthen berm would connect the upstream end of the extended guide wall with the Minnesota shore to prevent

woody debris and ice from accumulating behind the guide wall. The estimated cost of constructing the extended guide wall and channel modifications is $30,227,000 (Table 10-1).

The geometry of the dredge cut and filled area in the lock approach would be monitored for several years following construction to track changes in sediment movement and settlement of the rock cap in the filled area. Hydraulic performance of the channel modifications would be monitored to determine the degree to which the outdraft current is reduced and measure any changes in distribution of flow through the dam gates. Interviews with towboat pilots would be conducted to assess improvements to navigability. Operation and maintenance of the guide wall would include routine annual inspections and needed repairs to the structure. The estimated annual cost of operation, maintenance and repairs for the extended guide wall and channel modifications is $247,000.

Strengthened Wisconsin Embankments with Phased Construction

In Phase 1 of the embankments construction, the overflow weirs, called spot dikes, along the upper embankment would be rebuilt. New sheet pile would be driven at the spot dikes, offset about 15 feet from the old sheet pile. Rock riprap in the overflow channels of the spot dikes would be placed and keyed into the surrounding grade. Low areas that have scoured along the upper embankment would be filled. One or two additional spot dikes would be constructed in larger existing scour channels. A 10-foot-wide access trail of crushed rock along the upper embankment would be constructed to enable access for construction and later inspections and maintenance activities. The old Marsh Lake inlet culvert at spot dike D would be replaced.

A raised 400-foot-long embankment near the dam would be constructed to protect the gated part of the dam. A 400-foot-long Marsh Lake spillway would be constructed. The old Marsh Lake water control structures would be replaced with a new stoplog culvert water control structure. A 2,100-foot-long spillway between Gantenbein Lake and the river would be constructed, and a stoplog culvert Gantenbein Lake water control structure would be built.

The spillways would be constructed with ACM keyed into grade with rock on the upstream side and underwater downstream side. The ACM spillways and areas disturbed by construction would be planted with sandbar willow and other native flood-tolerant wetland plants.

The Phase 1 embankments construction would leave the wider land area between the Marsh Lake and Gantenbein Lakes spillways unprotected, along with the area from downstream end of the Gantenbein Lake spillway around the south end of Gantenbein Lake to the bluff. The embankments would be inspected regularly and after overtopping events. If breaches through the unprotected areas were to occur, additional segments of the lower embankment would be built as needed. An access trail for light trucks and personnel would be extended from the existing trail around the south end of Gantenbein Lake to the end of the Gantenbein Lake spillway if needed for phase 2 embankments construction in that area.

The upper embankment along the access trail and spot dikes would be kept free of woody vegetation by mechanical brushing. On the Marsh Lake and Gantenbein Lake spillways, the planted willows would be mowed about once every 5 years to prevent larger trees from growing in the ACM.

Vegetation on the ACM spillways and in the construction areas would be monitored and replanted as necessary to ensure good cover. The embankments would be inspected annually and after overtopping events.

The estimated cost of embankments construction is $33,644,000. Of that total, the estimated cost of Phase 2 construction, if needed in the future, would be $5,329,000. The estimated annual cost of operation, maintenance and repairs for the Wisconsin embankments was estimated to be $275,000, which is 1 percent of project construction cost.

Environmental Mitigation

Environmental mitigation features for the embankments construction include design features to avoid and minimize adverse effects of project construction. Compensatory mitigation for unavoidable impacts of construction on floodplain forest and channel border habitats would include real estate acquisition and restoration of 313 acres of floodplain forest in Pierce County Wisconsin. Real estate acquisition, forest restoration and annualized monitoring costs for environmental mitigation expressed on a present value basis are included as first costs of the project. The mitigation real estate acquisition and restoration work would be done before or concurrently with project construction. The estimated cost of real estate acquisition for environmental mitigation is $1,512,000. The estimated cost of floodplain forest restoration on the mitigation land is $256,000. Following the floodplain forest planting, the mitigation land would be monitored annually for 10 years to determine if the restoration objective is attained. Additional tree seeds and seedlings would be planted if needed.

The combined project is estimated to cost $63,871,000 to construct (Table 10-1). The tentatively recommended plan would contribute to the NED and have a benefit-cost ratio of 2.09. The project would meet the planning objectives of improving navigation safety and strengthening the Wisconsin embankments. The project would also meet the planning objective of protecting the river environment through protection of existing high-quality floodplain habitats and mitigation of impacts on significant resources and by reducing the risk of adverse environmental effects of navigation accidents, embankment failure and accidental drawdown of Pool 3.

The cost of construction and environmental mitigation would be 100-percent Federal, paid 50 percent each from the Inland Waterways Trust Fund and the general fund of the U.S. Treasury. Operation and maintenance of the project and phase 2 of embankments construction, if needed, would be accomplished through the Corps of Engineers Operation and Maintenance budget.

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to Congress as proposals for funding project information. However, prior to transmittal to Congress, the States, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

Table 10-1. Estimated cost of the tentatively selected plan for Lock and Dam 3.

Navigation and Embankments - Alternative Plan N6E5

5.1250% 50 years	Embankments	Navigation	Total
Real Estate	1,699,000	0	1,699,000
Environmental Mitigation	256,000	0	256,000
Stage 1			
Spot Dikes	3,924,000		3,924,000
Downstream Embankment	16,323,000		16,323,000
Navigation Safety			
Guidewall Extension		16,028,000	16,028,000
Upstream Channel Modifications		8,707,000	8,707,000
Stage 2	5,329,000		5,328,000
TOTAL EMBANKMENT	27,532,000		
TOTAL NAVIGATION		24,736,000	
TOTAL EMBANKMENT AND NAVIGATION			52,268,000
PED 11.60%	3,194,000	2,869,000	6,063,000
S&A 10.60%	2,918,000	2,622,000	5,540,000
TOTAL PROJECT COST W/O O&M	33,644,000	30,227,000	63,871,000
Annual O&M 1.0000%	275,000	247,000	522,000
Present Value O&M	4,925,000	4,424,000	9,349,000
TOTAL PROJECT COST W/O&M	38,569,000	34,651,000	73,220,000

CHAPTER 11. LIST OF PREPARERS

An interdisciplinary and experienced group of scientists and engineers served on the PDT and prepared this final general reevaluation report and EIS (Table 11-1).

Table 11-1. Lock and Dam 3 project team members and list of prepares for this report.

Name	Discipline/Expertise	Professional Experience	Role
Daniel Wilcox	Fisheries Biology, Planning	32 years	Project Manager, Planning, Environmental Resources
James Ulrick	Mechanical Engineering	6 years	Project Manager, Engineering Design and Construction
Jeff McGrath	Economics	27 years	Economics, Plan Formulation
Kent Hokens	Structural Engineering	21 years	Structural Engineering
Aaron Buesing	Hydraulic Engineering	15 years	Hydraulic Engineering
Kari Layman	Hydraulic Engineering	8 years	Hydraulic Engineering
Stuart Dobberpuhl	Hydraulic Engineering	35 years	Hydraulic Engineering
Chris Afdahl	Civil Engineering	16 years	General Engineering
Paul Madison	Geotechnical Engineering	26 years	Geotechnical Engineering
Gary Smith	Civil Engineering	32 years	Cost Engineering
Richard Femrite	Civil Engineering	17 years	Cost Engineering
Marcia McCloskey	Real Estate	20 years	Real Estate
Brad Perkl	Archaelogy	15 years	Cultural Resources
Jeff Gulan	Civil Engineering	20 years	Lock and Dam Operations
Dave Hawkenson	Lockmaster, Lock and Dam 3	33 years (now retired)	Lock and Dam Operations
Shannon Bauer	Journalism	10 years	Public Involvement
Edwin Bankston	Attorney at Law	33 years	Office of Counsel

This page intentionally left blank.

CHAPTER 12. REFERENCES

12.1 Bibliography

Anderson, D. D., D. B. Wilcox, and D. R. McConville. 1983. Physical and biological investigations of the main channel border habitat of Pool 5a on the Upper Mississippi River in 1980. 2 vols. U.S. Army Corps of Engineers, St. Paul District, St. Paul, Minnesota. 251 p.

Balogh, S. J., D. R. Engstrom, J. E. Almendinger, M. L. Meyer, and D. K. Johnson. 1999. "History of Mercury Loading in the Upper Mississippi River Reconstructed from the Sediments of Lake Pepin," Environmental Science and Technology, 33: 3297–3302.

Carlson, B., S. M. Bartell, and K. R. Campbell. 2000. "Effects of Recreational Boating: Recreational Traffic Forecasting and Allocation Models," Interim report for the Upper Mississippi River – Illinois Waterway Navigation Study, ENV Report 24, prepared for the U.S. Army Engineer District, Rock Island. Rock Island, Illinois.

Cobb, S.P. and A.D. Magoun. 1995. Physical and hydrologic characteristics of aquatic habitat associated with dike systems in the lower Mississippi River, River Mile 320 to 610. Lower Mississippi River Environmental Program, Report 5, Mississippi River Commission, Vicksburg, Mississippi.

Colingsworth, R. F., J. R. Gudmundson, W. L. K. Schwarz and C. W. Ruelius. 1973. Final Report, Environmental Impact Assessment Study, St. Croix River Pool of the Northern Section of the Upper Mississippi River. Contract DACW37-73-C-0059 report to the St. Paul District, U.S. Army Corps of Engineers. St. Paul, Minnesota.

Dewey, M. 1986. Substrate survey of the Upper Mississippi River at Lock and Dam 3. Report by the U.S. Fish and Wildlife Service, LaCrosse Wisconsin, for the St. Paul District, U.S. Army Corps of Enginers.

Dieterman, 1995. Stream Survey Report. Major river survey, backwaters of the Upper Mississippi River Pools 3, 5, 5A, 6 and 9, and lower Vermillion River, Minnesota Department of Natural Resources. Lake City, Minnesota.

Farr, M. D. 2001. Mussel Survey of Upper Pool 4, Mississippi River, August 2001. Report by the U.S. Army Engineer Research and Development Center Environmental Laboratory for the St. Paul District, U.S. Army Corps of Engineers. St. Paul, Minnesota.

Farr, M. D. 2004. Substrate Survey of Upper Pool 4, Mississippi River, August 2003. Report by the U.S. Army Engineer Research and Development Center Environmental Laboratory for the St. Paul District, U.S. Army Corps of Engineers. St. Paul, Minnesota.

Fish and Wildlife Work Group. 2004. Environmental Pool Plans, Mississippi River Pools 1-10. River Resources Forum. U.S. Army Corps of Engineers, St. Paul District. St. Paul Minnesota. http://www.mvp.usace.amry.mil/rrf/

Freeman, G. E., W. J. Rahmeyer, and R. R. Copeland. 2000. Determination of resistance due to shrubs and woody vegetation. U.S. Army Engineer Research and Development Center Coastal and Hydraulics Laboratory Technical Report CEERDC-CHL-TR-00-25. Vicksburg, Mississippi.

Fuller, S. L. H. 1978. Fresh-Water Mussels (Mollusca:Bivalve:Unionidae) in the Upper Mississippi River: Observations at selected sites within the 9-Foot Channel Navigation Project on behalf of the United States Army Corps of Engineers. Academy of Natural Sciences of Philadelphia. Philadelphia, Pennsylvania.

Gee, D. M., and D. B. Wilcox. 1985. Use of a two-dimensional flow model to quantify aquatic habitat. Technical Report No. 105. U.S. Army Corps of Engineers Hydrologic Engineering Center, Davis, California. 10 p.

Johnson, S. 1994. Recreational Boating Impact Investigations – Upper Mississippi River System Pool 4, Red Wing, Minnesota. Report by the Minnesota Department of Natural Resources for the National Biological Survey, Environmental Management Technical Center, Onalaska Wisconsin. EMTC 94-S004. 48 pp.

Hornbach, D. J. 2001. Draft: Revised Higgins' Eye Pearlymussel (*Lampsilis higginsii*) Recovery Plan. Report for Region 3, U.S. Fish and Wildlife Service, Ft. Snelling, Minnesota 55111-4056. pp. 84.

Knight, S. K. and T. M. Parchure. 2004. "Hydraulic Effects of Recreational Boat Traffic on the Upper Mississippi River System," Upper Mississippi River – Illinois Waterway Navigation Study ENV Report 43. Rock Island District, U.S. Army Corps of Engineers. Rock Island, Illinois.

Landwehr, K. J. and T. Nakato. 1999. "Identification of Potential Commercial Navigation Related Bank Erosion Sites," Upper Mississippi River – Illinois Waterway Navigation Feasibility Study ENV Report 9. Rock Island District, U.S. Army Corps of Engineers.

Lowry, D. R., M.P. Taylor, R.L. Warden and F.H. Taylor. 1987. Fish and benthic communities at eight Lower Mississippi River flood-plain lakes. Lower Mississippi River Environmental Program, Report 6, Mississippi River Commission, Vicksburg, Mississippi.

Miller, A. C., R. Whiting and D. B. Wilcox. 1989. "An Evaluation of a Skimmer Dredge for Collecting Freshwater Mussels," Journal of Freshwater Ecology, 5(2): 151-154.

Miller, E. F. K. Krumm, W. L. K. Schwarz and C. W. Rudelius. 1973. Final Report, Environmental Impact Assessment Study, Pool 3 of the Upper Mississippi River. Contract DACW37-73-C-0059 report to the St. Paul District, U.S. Army Corps of Engineers. St. Paul, Minnesota.

Noren, J. 2003. Upper Mississippi River 2002 Sediment Chemistry Survey of USACE Dredge Cuts. U.S. Army Corps of Engineers, St. Paul District. St. Paul, Minnesota.

Shows, L. J. and J. J. Franco. 1979. Navigation Conditions at the Upstream Approach to Lock and Dam No. 3 Mississippi River, Hydraulic Model Investigation. Technical Report HL-79-17. Hydraulics Laboratory U.S. Army Engineer Waterways Experiment Station. Vicksburg, Mississippi.

Talbot, M. 1979. Winter SCUBA Observations of Catfish Aggregations in Pool 4. Minnesota Department of Natural Resources. Lake City, Minnesota.

Thiel, P. A. 1981. "A Survey of Unionid Mussels in the Upper Mississippi River (Pools 3 through 11)." Technical Bulletin No. 124. Wisconsin Department of Natural Resources. Madison, Wisconsin.

Upper Mississippi River Conservation Committee. 2002. "Upper Mississippi River Water Quality Assessment." Water Quality Technical Work Group. Upper Mississippi River Conservation Committee. Rock Island, Illinois. http://www.mississippi-river.com/umrcc/wq_summary.html

U.S. Army Corps of Engineers. 1988. Lock and Dam 3 Navigation Safety Study, Mississippi River, Minnesota. General Design Memorandum and Draft Environmental Impact Statement. St. Paul District, U.S. Army Corps of Engineers, St. Paul, Minnesota.

U.S. Army Corps of Engineers. 1990. Lock and Dam 3 Navigation Safety Study, Mississippi River, Minnesota, Safety Study and Draft Environmental Impact Statement. St. Paul District, U.S. Army Corps of Engineers. St. Paul, Minnesota.

U.S. Army Corps of Engineers. 1995a. Lock and Dam 3 Navigation Safety Study, Safety Study, Mississippi River, Minnesota. St. Paul District, U.S. Army Corps of Engineers. St. Paul, Minnesota.

U.S. Army Corps of Engineers. 1995b. Lock and Dam 3 Embankments, Mississippi River, Minnesota, Major Rehabilitation Evaluation Report. St. Paul District, U.S. Army Corps of Engineers. St. Paul, Minnesota.

U.S. Army Corps of Engineers. 2000a. Planning Guidance. Engineering Regulation ER 1105-2-100. U.S. Army Corps of Engineers. Washington, D.C.

U.S. Army Corps of Engineers. 2000b. Upper Mississippi River System Habitat Needs Assessment, Summary Report (53pp), Technical Report (248pp). St. Louis District, U.S. Army Corps of Engineers. St. Louis, Missouri.

U.S. Army Corps of Engineers. 2004. Final Integrated Feasibility Report and Programmatic Environmental Impact Statement for the Upper Mississippi – Illinois Waterway Navigation Study. U.S. Army Corps of Engineers, Rock Island District. Rock Island, Illinois.

U.S. Coast Guard. 2006. Mississippi River and Tributaries Waterway Action Plan. Upper Mississippi River Annex. U.S. Coast Guard Upper Mississippi River Sector, St. Louis, Missouri. Available on-line at: http://www.uscg.mil/d8/sector/umr/wap.html

U.S. Geological Survey. 1998. Ecological Status and Trends of the Upper Mississippi River System, Long Term Resource Monitoring Program Report LTRMP 99-T001. Upper Midwest Environmental Science Center. La Crosse, Wisconsin. 236 pp.

Way, C.M., A.J. Burky, C.R.Bingham, and A.C. Miller. 1995. Substrate Roughness, Velocity Refuges, and Macroinvertebrate Abundance on Artificial Substrates in the Lower Mississippi River**.** Journal of the North American Benthological Society*,* Vol. 14, No. 4, pp. 510-518.

WEST Consultants Inc. 2000. Upper Mississippi River and Illinois Waterway Navigation Feasibility Study – Cumulative Effects Study, Volume 1 Geomorphic Assessment, Volume 2 Ecological Assessment. Prepared by West Consultants Inc., for the U.S. Army Corps of Engineers, Rock Island District. Rock Island, Illinois.

Wilcox, D. B. 1988. Use of a 2-D numerical hydraulic model to predict riverine habitat conditions. *In* Proceedings of the 1988 Annual Meeting of the U.S. Army Environmental Advisory Board. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

Wilcox, D. B. 1987. Effects of river discharge on tailwater habitat at lock and dam 3, Upper Mississippi River. *In* Proceedings of the 1987 Annual Meeting of the Upper Mississippi River Conservation Committee, Rock Island, Illinois.

12.2 Acronyms and Abbreviations

ACM	articulated concrete mat
BCR	benefit-cost ration
cfs	cubic feet per second
cy	cubic yards
DO	dissolved oxygen
EIS	environmental impact statement
EMTS	Emergency Management of the Transportation System
ERDC	Engineer Research and Development Center
ESF	Emergency Support Function
GPS	global positioning system
IMA	Institute for Minnesota Archaeology
kg	kilogram
mg	milligram
mm	millimeter
MDNR	Minnesota Department of Natural Resources
MDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
msl	mean sea level, 1929 adjustment
MVAC	Minnesota Valley Archaeology Center
NED	national economic development
NEPA	National Environmental Policy Act

NESP	Navigation and Ecosystem Sustainability Program
NRHP	National Register of Historic Places
NTU	nephelometric turbidity units
PCB	polychlorinated biphenyl
PDT	project delivery team
RIAC	River Industry Action Committee
ROD	record of decision
SHPO	State Historic Preservation Office/Officer
SPRA	Screening Portfolio for Risk Assessment of Dams
ug	microgram
UMRS-EMP	Upper Mississippi River System - Environmental Management Program
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDNR	Wisconsin Department of Natural Resources
WES	U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi (now named the U.S. Army Engineer Research and Development Center)
WDOT	Wisconsin Department of Transportation

This page intentionally left blank.

CHAPTER 13. COMMENTS ON THE DRAFT INTEGRATED GENERAL REEVALUATION REPORT AND EIS AND RESPONSES BY THE ST. PAUL DISTRICT

This chapter of the final integrated general reevaluation report and EIS includes copies of the letters from stakeholders providing comments on the draft report and St. Paul District's responses to those comments. Places in the final report where changes were made are indicated in our responses.

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Scott Hassett, Secretary
Scott Humrickhouse, Regional Director

West Central Region Headquarters
1300 W. Clairemont Avenue
PO Box 4001
Eau Claire, Wisconsin 54702-4001
Telephone 715-839-3700
FAX 715-839-6076
TTY Access via relay - 711

October 5, 2006

Mr. Daniel Wilcox
CEMVP-PM-E
190 Fifth Street East, Suite 401
St. Paul, MN 55101

Subject: August 2006 Draft GRR and EIS for Lock and Dam 3

Dear Mr. Wilcox:

The Wisconsin DNR Mississippi River Team has reviewed and discussed the Draft Integrated General Reevaluation Report and Environmental Impact Statement for Lock and Dam 3 Mississippi River Navigation Safety and Embankments (DGRR/EIS). Our team has been actively engaged throughout the history of the project and believes that there has been significant progress made since the initial stages. Further we agree that we are at least partially on track toward meeting the planning objectives of improving navigation safety, reducing the risk of embankment failure, and protecting the river environment.

In that respect, we recommend proceeding with the navigation safety improvements and work on the upper embankment spot dikes. Both of our agencies share the primary concern to eliminate the risk of a serious commercial tow accident and to stabilize the embankment structure at Lock and Dam 3; implementation of these two project features should substantially address those concerns, and we will continue to work cooperatively with the COE to accomplish this portion of the project. Upon receipt of Detailed Plans and Specifications for the Navigation Safety Project and the Upper Spot Dikes we should be able to proceed relatively quickly with the chapter 30 permit and water quality certification.

The Wisconsin DNR asserts that fish passage is an imperative element in the lower embankment construction so we do not support starting any major work on the lower embankment until fish passage can be funded as part of the overall project. When funding sources have been identified for fish passage, we believe that a staged approach to the Embankment Phase 1 will better meet the planning objective of *protecting the river environment*. A staged approach will still achieve the objective of stabilizing the embankment, but will further avoid and minimize undue destruction to valuable habitat (see section in this letter entitled, Wisconsin DNR Recommended Approach).

Fish Passage

We have maintained throughout the planning phases that LD 3 is a critical point for fish passage because it would connect several important waterways, and that this project provides the best opportunity to establish fish passage at this location. The Wisconsin DNR agrees with the conclusion in the COE Document ENV 54 (Wilcox) that fish passage at Lock and Dam 3 will connect the migration habitat of the areas of critical fisheries and mussel habitats. This area contains the lower St Croix River, lower Chippewa River, and Lake Pepin.

Improving fish passage through the dams is recognized as an important way to improve the river ecosystem. Dams fragment habitat for native species, and a passage structure will increase habitat connectivity for both fish and mussel communities. There are >34 migratory fishes in the UMRS. Many have seasonal habitat requirements and migration behavior, but we acknowledge that there are many migratory species, with a wide range of swimming performance, migration behavior, and habitat needs. This portion of the Mississippi River is in need of reconnection for a multitude of species such as sturgeon and paddlefish, to important sport and commercial species, and ecological keystones species.

Given that both Wisconsin and the COE have recognized the need for fish passage, we believe that the best fiscal approach for construction near the dam dictates that fish passage be included with initial construction. Construction of a fish passage structure after raising the embankment next to the gated part of the dam would not be a wise use of public funding due to the necessity of removing new construction. Wisconsin believes the COE has the authority and the mandate to provide passage at these structures. The final report should include fish passage as an alternative in the main body of the report, along with an incremental cost analysis that clearly defines construction costs both with and without a fish passage structure.

Navigation Safety Project Considerations

Outdraft conditions and resultant accidents will continue to threaten human life, the Wisconsin embankments, Pool 3, and contamination of the River environment. We expect substantial improvement to both the navigation safety and embankment stabilization (due to reduced risk of overtopping subsequent to an accident) with the recommended alternative N6. We therefore support the concept of an extended guidewall and channel modifications but have the following comments:

1. Based on comments provided by towboat pilots, the outdraft current becomes difficult to navigate when river discharge exceeds about 21,000 cfs (page 3-6 in DEIS). We contend that the Secretary of the Army, in conjunction with the U.S. Coast Guard, should use the authority granted under 33 U.S.C. § 1 to prescribe regulations to protect life and property when discharge exceeds 21,000 cfs by requiring use of an appropriately sized helper boat.

2. The report indicates that 118,000 cy of sand would be dredged to form the new alignment channel for the approach to the gated portion of the dam. This material is primarily sandy deposits with a mean silt and clay content of about 7% based on composite sediment cores of the dredge cut. We have generally allowed for in-water placement of dredge materials when the fine fraction is less than 10% (i.e. island construction associated with habitat projects). It appears that the dredge cut sediments would meet these placement criteria.

3. The excavated material will be mechanically placed in the lock approach and covered with large rock. Contaminant analysis of the dredge cut and the layer of sediment to be exposed indicates contaminants are below the levels of detection or present at low concentrations. The only possible exception is g-chlordane which was detected in 4 cores at carbon-normalized concentrations ranging from 84 to 611 ug/g organic carbon (OC). The Department's recommended sediment quality guideline lists a probable effect concentration (PEC) of 1800 ug/g OC for total chlordane and a threshold effect concentration (TEC) of 320 ug/g OC for this contaminant. The chlordane TEC level was only exceeded in 1 of the 10 sediment samples. No other pesticides or PCBs were detected. Heavy metal concentrations are relatively low and reflective of coarse main channel sediments with little organic matter and low levels of fine particles. We don't foresee any serious water quality concerns associated with the dredging and relocation of these sediments in the main channel with this activity, especially if it is accomplished during periods of lower flows.

4. The main channel dredging and modifications above LD 3 will likely impact the mixing zone of the Prairie Island Nuclear Generating facility's thermal discharge located just upstream of the construction site. The Corps needs to evaluate how this project may change the thermal mixing zone, and possibly influence the point of compliance with the thermal discharge limitations provided in the Minnesota Pollution Control Agency's National Pollution Discharge Permit.

5. The main channel work appears to be in both MN and WI. The precise location of the state line needs to identified prior to work for proper review and certification.

6. The completed project should be closely monitored to determine whether the expected results were realized, and that the outdraft was reduced across the full range of river discharges.

7. Sedimentation in the channel will reduce the benefits of this project such that routine dredging will be required to maintain desired channel conditions. Plans should include intended future placement sites and anticipated quantities.

8. The planned closure dike and extended guidewall will eliminate access to a slack-water area that can be used by small water craft while waiting for lockage. This presents a potential hazard for small watercraft attempting to access the locks when tows are present. Future plans should consider options for reducing this risk and for providing safe staging areas for recreational craft

Upper Embankment Project Considerations

We support reconstruction of the upper spot dikes as described in the recommended alternative N6E5, with the following specific comments:

1. During planning meeting discussions and onsite visits we were assured that the maintenance road would be only large enough to support light traffic (e.g., a maintenance trail). Construction is proposed to be completed from the road, suggesting that the road will need to be large enough to support heavy equipment and staging areas. This will result in unnecessary loss of important riparian habitat; we prefer that construction take place from the water to minimize losses.

2. A photo with simulated conditions would help depict anticipated conditions after construction.

3. Portions of the existing bank will removed during spot dike reconstruction. A sediment contaminant evaluation will need to be performed on the fine fraction of the embankment materials and placement sites must be identified.

4. We do not support raising the embankment at the dam during this phase if it will need to be removed for a later fish passage structure.

Lower Embankment Project Considerations

We have made considerable progress since the initial project designs by reducing potential habitat loss and protecting native mussel beds, however we continue to have concern over the relatively large project-related impacts to an important wetland and floodplain forest complex. In an effort to continue to make progress toward meeting the planning objectives we have determined the following alternative approach to the Embankments Phase:

WDNR Recommended Approach

We fully support an adaptive management approach and phased work on the lower embankments, and suggest that the Embankments Phase I be further divided into stages as described below. The spot dikes on the upper embankment have provided nearly 70 years of protection. As described in alternative E5, the sheet pile will be driven downward 30 feet to withstand scour in the event of lower embankment failure. This additional protection afforded by spot dike reconstruction coupled with the navigation safety improvements allows room for additional adaptive stages. The additional stages (implemented only if further breaches occur), will still achieve all of the planning objectives while giving critical attention to the third objective (protect the river ecosystem) by avoiding and minimizing environmental impacts to the fullest extent possible.

Phase 1, Stage 1 – Strengthen Lower Embankment

- This phase of the project would be completed in addition to reconstruction of the upper embankment spot dikes.
- Repair existing rip-rap where breaches have occurred in the past
- Restore the earthen berm that was eroded during overtopping at the lower end of Gantenbein Lake.

Phase I, Stage 2 - Construct Fish Passage and Marsh Lake Spillway

- A raised embankment structure at the dam that includes a fish passage structure
- Construct a 400' sheet pile spillway structure at Marsh Lake with specifications similar to those used for the spot dikes. We believe that this will further stabilize the material with fewer environmental consequences
- Reconstruct the Marsh Lake outlet structure
- Construct Gantenbein water control outlet structure

This stage would be implemented as needed through interagency coordination.

Phase 1, Stage 3 – Construct Gantenbein Lake Spillway

- Construction of a 2100' sheet pile spillway at Gantenbein Lake with specifications similar to those used for the spot dikes.

This stage would be implemented as needed through interagency coordination.

Phase 1, Stage 4 – Construct ACM Spillway at Marsh and Gantenbein Lakes

- This phase would be similar to the Phase I approach recommended in the DEIS for the lower embankment and would include construction of an ACM spillway at Marsh and Gantenbein Lake

This stage would be implemented as needed through interagency coordination.

Phase II: Strengthen Embankments

If this phase would be required, then the lower embankment work as described in original Phase II of the DGRR/EIS would be reviewed for possible staged implementation. This stage would be implemented through interagency coordination only if breaches continued to occur

Additional Comments on Lower Embankment Plan Proposed in the DGRR/EIS

1. Although the plan indicates that the Marsh Lake spillway will be 400 feet in length, the total altered area will be about 1750 feet, extending from the dam to the Marsh lake outlet. The disturbed area for the Gantenbein spillway and outlet will be about 2200 feet, for a total project length of about ¾ miles. Only 1850 feet will be left undisturbed between the two areas. The undulating terrestrial surface and vegetation will be replaced by leveled surface for much of the project length.

2. Sandbar willows will reduce the visual impacts from the project, but both standing trees and in-water woody debris provide important habitat for many species at various life stages. During an on-site inspection meeting at the lower embankment we discussed the importance of protecting both standing and in-water trees, and Corps engineers indicated that they would evaluate ways to secure the embankment while maintaining portions of both types of habitat. The simulated image and descriptions indicate that ACM will be used over the entire area leaving little remaining floodplain forest.

3. The cross-section drawing in the DGRR/EIS depicts ACM extending out to a water depth of about 16 feet with two feet of rock fill at the toe. This is a significant change from earlier drawings that indicated the rock rip rap would used to secure the same area of embankment. Underwater rock riprap provides important interstitial space for a wide variety of aquatic organisms, whereas the ACM will only provide monotypic engineered grade to the depth of 14 feet. We strongly contend that should the need arise to construct this portion of the embankment that the design revert to the designed completed in January, 2005 where some underwater riprap is present.

4. A road extending from the bluff to Gantenbein spillway means a tremendous amount of destruction for inspection reasons. This is unnecessary because inspection is easy from the water, and the lock house is nearby. Water temperature is elevated due to the power plant above the site, making the area ice-free and accessible year-round.

5. Alternative N6 states that the Corps has authority to impose wake wave restrictions only in close proximity to locks and dams; as part of the dam structure, the lower embankment may be within that authority. The Corps should consider wake restrictions in that area as an additional measure to prevent erosion.

6. Small and medium sized equipment and materials will come in via land and the larger material quantities and large equipment will arrive by water. The size of the staging area must be clearly stated and delineated, and kept to a minimum size.

Mitigation

The proposed mitigation is a reasonable replacement for unavoidable habitat losses, and we agree that mitigation for all intended phases, whether built or not, is a desirable way to proceed. With this approach it is more likely that large contiguous tracts of land will be restored and delays in future stages of the project will be minimized.

Land acquisition may be difficult so all parcels must be in federal ownership prior to any construction. The Wisconsin DNR will likely take over management of the land for a wildlife area with two caveats:

1. A land transfer to the State of Wisconsin must be approved by the Natural Resources Board.

2. Or, if the Corps retains the property while the Wisconsin DNR provides management, the terms would need to be expressed in a Memorandum of Understanding between the DNR and Corps.

We thank the Corps of Engineers for the partnership and progress to date. Proceeding with the significant features in this report of navigation safety and the upper embankment will help to secure the pool, navigation and power plants above Lock and Dam 3. Wisconsin DNR looks forward to continued progress on the project objectives as we move into the final phases with you and your staff.

Sincerely,

Gretchen L Benjamin
Mississippi River Team Leader

C Scot Johnson, MNDNR, Lake City, MN
Jack Emblom, MPCA, St. Paul, MN
Gary Wege, USFWS, Bloomington, MN
Judy DesHarnais, COE, St. Paul, MN
Dave Pericak, WDNR, La Crosse, WI
Michael Scott, WDNR, Madison, WI
Dan Baumann, WDNR, Eau Claire, WI

St. Paul District Responses to Wisconsin Department of Natural Resources (WDNR) Comments (letter dated October 5, 2006)

Comment:
The Wisconsin DNR Mississippi River Team has reviewed and discussed the Draft Integrated General Reevaluation Report and Environmental Impact Statement for Lock and Dam 3 Mississippi River Navigation Safety and Embankments (DGRR/EIS). Our team has been actively engaged throughout the history of the project and believes that there has been significant progress made since the initial stages. Further we agree that we are at least partially on track toward meeting the planning objectives of improving navigation safety, reducing the risk of embankment failure, and protecting the river environment.

In that respect, we recommend proceeding with the navigation safety improvements and work on the upper embankment spot dikes. Both of our agencies share the primary concern to eliminate the risk of a serious commercial tow accident and to stabilize the embankment structure at Lock and Dam 3; implementation of these two project features should substantially address those concerns, and we will continue to work cooperatively with the COE to accomplish this portion of the project. Upon receipt of Detailed Plans and Specifications for the Navigation Safety Project and the Upper Spot Dikes we should be able to proceed relatively quickly with the chapter 30 permit and water quality certification.

Response:
We will work with the WDNR on the design documentation report and plans and specifications for the project. We will apply for State water quality certification and a State waters permit out of comity prior to contracting for construction.

Comment:
The Wisconsin DNR asserts that fish passage is an imperative element in the lower embankment construction so we do not support starting any major work on the lower embankment until fish passage can be funded as part of the overall project. When funding sources have been identified for fish passage, we believe that a staged approach to the Embankment Phase 1 will better meet the planning objective of *protecting the river environment*. A staged approach will still achieve the objective of stabilizing the embankment, but will further avoid and minimize undue destruction to valuable habitat (see section in this letter entitled, Wisconsin DNR Recommended Approach).

Fish Passage

We have maintained throughout the planning phases that LD 3 is a critical point for fish passage because it would connect several important waterways, and that this project provides the best opportunity to establish fish passage at this location. The Wisconsin DNR agrees with the conclusion in the COE Document ENV 54 (Wilcox) that fish passage at Lock and Dam 3 will connect the migration habitat of the areas of critical fisheries and mussel habitats. This area contains the lower St Croix River, lower Chippewa River, and Lake Pepin.

Improving fish passage through the dams is recognized as an important way to improve the river ecosystem. Dams fragment habitat for native species, and a passage structure will increase habitat connectivity for both fish and mussel communities. There are >34 migratory fishes in the UMRS. Many have seasonal habitat requirements and migration behavior, but we

acknowledge that there are many migratory species, with a wide range of swimming performance, migration behavior, and habitat needs. This portion of the Mississippi River is in need of reconnection for a multitude of species such as sturgeon and paddlefish, to important sport and commercial species, and ecological keystones species.

Given that both Wisconsin and the COE have recognized the need for fish passage, we believe that the best fiscal approach for construction near the dam dictates that fish passage be included with initial construction. Construction of a fish passage structure after raising the embankment next to the gated part of the dam would not be a wise use of public funding due to the necessity of removing new construction. Wisconsin believes the COE has the authority and the mandate to provide passage at these structures. The final report should include fish passage as an alternative in the main body of the report, along with an incremental cost analysis that clearly defines construction costs both with and without a fish passage structure.

Response:
We agree that a fishway at Lock and Dam 3 could be ecologically effective and that cost savings could be achieved by constructing a fishway concurrently with lower embankment construction; however, the St. Paul District does not presently have the authority or a funding source to construct a fishway at Lock and Dam 3.

Section 206 of the Water Resources Development Act of 1996 provides authority for the Corps of Engineers to undertake restoration projects in aquatic ecosystems such as rivers, lakes and wetlands. The Corps evaluates projects that benefit the environment through restoring, improving, or protecting aquatic habitat for plants, fish and wildlife. A project is accepted for construction after a detailed investigation shows it is technically feasible, environmentally acceptable, and provides cost effective environmental benefits. Each project must be complete within itself, not a part of a larger project. Costs for Section 206 projects are shared between the Federal Government and a non-Federal sponsor in accordance with the Water Resources Development Act of 1996. The maximum Federal expenditure per project is $5 million, which includes both planning and construction costs. Costs of lands, easements, and project operation and maintenance are non-Federal costs. Funding for this program has been limited nationally by congressional appropriations.

As indicated in the draft Lock and Dam 3 report, we may be able to incorporate a fishway into the Lock and Dam 3 project though the Navigation and Ecosystem Sustainability Program, if that program receives authorization and funding through Congress.

Comment:
Navigation Safety Project Considerations

Outdraft conditions and resultant accidents will continue to threaten human life, the Wisconsin embankments, Pool 3, and contamination of the River environment. We expect substantial improvement to both the navigation safety and embankment stabilization (due to reduced risk of overtopping subsequent to an accident) with the recommended alternative N6. We therefore support the concept of an extended guidewall and channel modifications but have the following comments:

1. Based on comments provided by towboat pilots, the outdraft current becomes difficult to navigate when river discharge exceeds about 21,000 cfs (page 3-6 in DEIS). We contend that the Secretary of the Army, in conjunction with the U.S. Coast Guard, should use the authority granted under 33 U.S.C. § 1 to prescribe regulations to protect life and

property when discharge exceeds 21,000 cfs by requiring use of an appropriately sized helper boat.

Response:
We agree that it would be prudent to pursue increased use of a helper boat by down bound tows during outdraft conditions as an interim measure. We modified the report to retain the "Require Helper Boat Use" alternative as an interim measure and included this statement:

> The Corps of Engineers, through the Secretary of the Army has the authority to require use of a helper boat at Lock and Dam 3. As an interim measure until navigation safety improvements are constructed, the St. Paul District will pursue complete voluntary compliance by the towing industry for helper boat use during outdraft conditions (river discharge greater than 21,000 cfs) for down bound tows approaching Lock and Dam 3 with six or more loaded barges.

Comment:

2. The report indicates that 118,000 cy of sand would be dredged to form the new alignment channel for the approach to the gated portion of the dam. This material is primarily sandy deposits with a mean silt and clay content of about 7% based on composite sediment cores of the dredge cut. We have generally allowed for in-water placement of dredge materials when the fine fraction is less than 10% (i.e. island construction associated with habitat projects). It appears that the dredge cut sediments would meet these placement criteria.

3. The excavated material will be mechanically placed in the lock approach and covered with large rock. Contaminant analysis of the dredge cut and the layer of sediment to be exposed indicates contaminants are below the levels of detection or present at low concentrations. The only possible exception is g-chlordane which was detected in 4 cores at carbon-normalized concentrations ranging from 84 to 611 ug/g organic carbon (OC). The Department's recommended sediment quality guideline lists a probable effect concentration (PEC) of 1800 ug/g OC for total chlordane and a threshold effect concentration (TEC) of 320 ug/g OC for this contaminant. The chlordane TEC level was only exceeded in 1 of the 10 sediment samples. No other pesticides or PCBs were detected. Heavy metal concentrations are relatively low and reflective of coarse main channel sediments with little organic matter and low levels of fine particles. We don't foresee any serious water quality concerns associated with the dredging and relocation of these sediments in the main channel with this activity, especially if it is accomplished during periods of lower flows.

Response:
We agree.

Comment:

4. The main channel dredging and modifications above LD 3 will likely impact the mixing zone of the Prairie Island Nuclear Generating facility's thermal discharge located just upstream of the construction site. The Corps needs to evaluate how this project may change the thermal mixing zone, and possibly influence the point of compliance with the thermal discharge limitations provided in the Minnesota Pollution Control Agency's National Pollution Discharge Permit.

Response:

Xcel Energy has a National Pollution Discharge Elimination System (NPDES) permit with the Minnesota Pollution Control Agency for thermal discharge to the river from the Prairie Island Nuclear Generating Plant (PINGP). The point of compliance for monitoring the thermal discharge is at Lock and Dam 3. Monitoring thermistors are mounted on the dam gate piers. Water passing through the dam becomes thoroughly mixed in the immediate tailwater. The channel modifications and the extended guide wall would change the configuration of the river and the flow pattern upstream of Lock and Dam 3. Numerical hydraulic modeling indicates that the distribution of flow through the four roller gates would not change significantly and should not affect the configuration of the thermal plume from the PINGP at the dam or change the thermal regime in the tailwater. We consulted with Xcel Energy on this matter, and they concur (Patrick Flowers, Xcel Energy, personal communication, October 2006). We added this paragraph to the final report.

Comment:

5. The main channel work appears to be in both MN and WI. The precise location of the state line needs to identified prior to work for proper review and certification.

Response:
The State line is indicated in the project drawings in Plates 1, 3, and 4.

Comment:

6. The completed project should be closely monitored to determine whether the expected results were realized, and that the outdraft was reduced across the full range of river discharges.

Response:
The geometry of the dredge cut and filled area in the lock approach would be monitored to track changes in sediment movement and settlement of the rock cap in the filled area. Hydraulic performance of the channel modifications would be monitored at several levels of river discharge to determine the degree to which the outdraft current is reduced and to measure any changes in distribution of flow through the dam gates. Tow boat pilots would be interviewed to assess changes to navigability of the upper lock approach. River discharge, navigation traffic and accidents will continue to be monitored.

Comment:

7. Sedimentation in the channel will reduce the benefits of this project such that routine dredging will be required to maintain desired channel conditions. Plans should include intended future placement sites and anticipated quantities.

Response:
Numerical hydraulic modeling indicates that the geometry of the dredge cut upstream of Lock and Dam 3 would not change markedly, and we do not anticipate the need for maintenance dredging. The geometry of the dredge cut and filled area in the lock approach would be monitored to track changes in sediment movement and settlement of the rock cap in the filled area.

Comment:

8. The planned closure dike and extended guidewall will eliminate access to a slack-water area that can be used by small water craft while waiting for lockage. This presents a

potential hazard for small watercraft attempting to access the locks when tows are present. Future plans should consider options for reducing this risk and for providing safe staging areas for recreational craft.

Response:
The backwater area on the Minnesota side just upstream of Lock and Dam 3 is no longer used as a waiting area by recreational boaters because the entrance has shoaled. That area was not a good waiting area for recreational boaters because of inability to see the signal light on the lock wall and because boaters exiting that area could not see up bound vessels. Most down bound recreational boaters wait for lockage on the Wisconsin side of the river in the area of the point bar. The extended guide wall would leave the lock approach open and should not significantly change existing conditions for recreational boaters.

Comment:
Upper Embankment Project Considerations

We support reconstruction of the upper spot dikes as described in the recommended alternative N6E5, with the following specific comments:

1. During planning meeting discussions and onsite visits we were assured that the maintenance road would be only large enough to support light traffic (e.g., a maintenance trail). Construction is proposed to be completed from the road, suggesting that the road will need to be large enough to support heavy equipment and staging areas. This will result in unnecessary loss of important riparian habitat; we prefer that construction take place from the water to minimize losses.

Response:
The access along the spot dikes will be a one-way, one-lane (10 feet wide) rock and gravel trail that will ford the spot dike channels, following the existing trail between the spot dikes. The trail is needed for construction and subsequent inspections and maintenance. Construction of the spot dikes cannot be done from the water because their locations are set well back from the river. We will consult with the WDNR on the layout of the trail between spot dikes A and B to minimize impacts on floodplain forest during preparation of the design documentation report.

Comment:
2. A photo with simulated conditions would help depict anticipated conditions after construction.

Response:
We included a simulated image of one or more of the spot dikes following construction in the final report. The appearance of the upper embankment area will be essentially the same as today, only with more riprap on either side of the sheet pile weirs. The view of the spot dikes from the river will be unchanged.

Comment:
3. Portions of the existing bank will removed during spot dike reconstruction. A sediment contaminant evaluation will need to be performed on the fine fraction of the embankment materials and placement sites must be identified.

Response:
None of the existing riverbank will be removed for spot dike construction. That area has been graded and armored with riprap. Material excavated for the spot dikes construction will be removed and placed at an upland site. Silt curtains will be installed during construction to limit sediment movement in the spot dike channels.

Comment:

4. We do not support raising the embankment at the dam during this phase if it will need to be removed for a later fish passage structure.

Response:
We share your interest in a fishway, but the St. Paul District needs authority and funding to include a fishway in the project as noted above. The cost to build a fishway later would be greater, but the fishway would not go through the raised embankment adjacent to the dam gates. The fishway would go around the raised portion of the embankment and cross at the west end of the Marsh Lake spillway.

Comment:
Lower Embankment Project Considerations

We have made considerable progress since the initial project designs by reducing potential habitat loss and protecting native mussel beds, however we continue to have concern over the relatively large project-related impacts to an important wetland and floodplain forest complex. In an effort to continue to make progress toward meeting the planning objectives we have determined the following alternative approach to the Embankments Phase 1:

WDNR Recommended Approach

We fully support an adaptive management approach and phased work on the lower embankments, and suggest that the Embankments Phase I be further divided into stages as described below. The spot dikes on the upper embankment have provided nearly 70 years of protection. As described in alternative E5, the sheet pile will be driven downward 30 feet to withstand scour in the event of lower embankment failure. This additional protection afforded by spot dike reconstruction coupled with the navigation safety improvements allows room for additional adaptive stages. The additional stages (implemented only if further breaches occur), will still achieve all of the planning objectives while giving critical attention to the third objective (protect the river ecosystem) by avoiding and minimizing environmental impacts to the fullest extent possible.

Response:
The extended guide wall, channel modifications and the strengthened the spot dikes would lessen the likelihood of a navigation accident and embankment failure that would jeopardize control of Pool 3. Unfortunately, the risk of a gate blockage event (e.g., barges in the dam gates due to a navigation accident or a woody debris jam) remains. The Prairie Island and Allen S. King power plants may be affected by an accidental drawdown of Pool 3. We assessed project alternatives and residual risks in the risk assessment study and found that the most vulnerable portions of the lower embankment must be protected against a gate blockage event, which would cause high head and high velocity conditions along the lower embankment. Riprap is not sufficient to withstand the high velocities associated with a gate blockage event; articulated concrete mat (ACM) is proposed. As stated in the report, the Corps agrees that

portions of the lower embankment are sufficiently strong at this time and can be left for a second stage of construction that would occur only after additional erosion of those portions of the lower embankment, but there is some risk associated with leaving those portions of the embankment until a later time. The proposed work along the spot dike alignment is partly in response to the risk associated with not improving portions of the lower embankment (the spot dike work is also partly in response to degradation that has occurred along the spot dike alignment).

We will construct all features of the Phase 1 embankments construction as described in Alterative E5 in the draft GRR/EIS. All features are needed in combination to have an embankment system that can resist the forces of overtopping, seepage, concentration of flow by woody debris, wave action and river currents. Construction scheduling will be contingent on available funding. We will work closely with the WDNR, Minnesota Department of natural Resources (MnDNR), U.S. Fish and Wildlife Service (USFWS), and the landowners on the construction schedule in development of the design documentation report and plans and specifications.

Comment:
Phase 1, Stage 1 – Strengthen Lower Embankment

- This phase of the project would be completed in addition to reconstruction of the upper embankment spot dikes.

- Repair existing rip-rap where breaches have occurred in the past

- Restore the earthen berm that was eroded during overtopping at the lower end of Gantenbein Lake.

Response:
The lower embankment between Gantenbein Lake and the river is one of the most vulnerable parts of the embankment system. A properly designed and constructed spillway is needed. An ACM spillway would withstand overflow as well as wave action and river currents. A riprapped earthen embankment would not withstand overflow long, and would result in embankment system failure, erosive disturbance of the Gantenbein Lakes and the channel border area, and additional construction disturbance during repairs and reconstruction.

Comment:
Phase I, Stage 2 - Construct Fish Passage and Marsh Lake Spillway

- A raised embankment structure at the dam that includes a fish passage structure

Response:
See responses about including a fishway above.

Comment:

- Construct a 400’ sheet pile spillway structure at Marsh Lake with specifications similar to those used for the spot dikes. We believe that this will further stabilize the material with fewer environmental consequences

- Reconstruct the Marsh Lake outlet structure

- Construct Gantenbein water control outlet structure

This stage would be implemented as needed through interagency coordination.

Response:
The large amount of flow that would pass through Marsh Lake to the Mississippi River will require a spillway that would withstand overtopping as well as wave action and river currents and be resistant to seepage and undermining. An ACM spillway is needed. The spot dike sheet pile and riprap design would not suffice.

Comment:
Phase 1, Stage 3 – Construct Gantenbein Lake Spillway

- Construction of a 2100' sheet pile spillway at Gantenbein Lake with specifications similar to those used for the spot dikes.

This stage would be implemented as needed through interagency coordination.

Response:
The large amount of flow that would pass between Gantenbein Lake and the river will require a spillway that would withstand overtopping as well as wave action and river currents and be resistant to seepage and undermining. The spot dike sheet pile and riprap design would not suffice. An ACM spillway is needed.

Comment:
Phase 1, Stage 4 – Construct ACM Spillway at Marsh and Gantenbein Lakes

- This phase would be similar to the Phase I approach recommended in the DEIS for the lower embankment and would include construction of an ACM spillway at Marsh and Gantenbein Lake

This stage would be implemented as needed through interagency coordination.

Response:
The ACM spillways are needed in Phase 1 construction to strengthen the embankments and to avoid future disturbances to the area from embankment failure, repairs and subsequent construction.

Comment:
Phase II: Strengthen Embankments

If this phase would be required, then the lower embankment work as described in original Phase II of the DGRR/EIS would be reviewed for possible staged implementation. This stage would be implemented through interagency coordination only if breaches continued to occur.

Response:
The embankments would be inspected regularly and after overtopping events. If breaches through the unprotected areas were to occur, Phase 2 segments of the lower embankment would be built as needed. It may not be necessary to construct all the Phase 2 parts of the lower embankment. The construction needed will be determined in consultation with the landowners, WDNR, MDNR and USFWS.

Comment:
Additional Comments on Lower Embankment Plan Proposed in the DGRR/EIS

1. Although the plan indicates that the Marsh Lake spillway will be 400 feet in length, the total altered area will be about 1750 feet, extending from the dam to the Marsh lake outlet. The disturbed area for the Gantenbein spillway and outlet will be about 2200 feet, for a total project length of about ¾ miles. Only 1850 feet will be left undisturbed between the two areas. The undulating terrestrial surface and vegetation will be replaced by leveled surface for much of the project length.

2. Sandbar willows will reduce the visual impacts from the project, but both standing trees and in-water woody debris provide important habitat for many species at various life stages. During an on-site inspection meeting at the lower embankment we discussed the importance of protecting both standing and in-water trees, and Corps engineers indicated that they would evaluate ways to secure the embankment while maintaining portions of both types of habitat. The simulated image and descriptions indicate that ACM will be used over the entire area leaving little remaining floodplain forest.

Response:
We examined alternative ways to strengthen the lower embankment and minimize the construction footprint. Alternative E5 Phase 1 would leave parts of the lower embankment unprotected, and the floodplain forest in these areas would remain undisturbed. The ACM spillways with willow plantings were proposed instead of roller-compacted concrete or riprap spillways to provide habitat connectivity for reptiles and amphibians between the lakes and the river and to provide less visually intrusive structures. Native floodplain vegetation would be planted on the ACM spillways and in the areas disturbed by construction. The Marsh Lake spillway needs to be 400 feet long to maintain conveyance with a 400-foot raised embankment near the dam. The length of the Gantenbein Lake spillway is determined by the existing topography. We will consult with the WDNR and the landowners about configuration of the areas disturbed by construction during development of the design documentation report. Some variety in elevation of those areas could provide more diversity in the vegetation that becomes established.

Comment:

3. The cross-section drawing in the DGRR/EIS depicts ACM extending out to a water depth of about 16 feet with two feet of rock fill at the toe. This is a significant change from earlier drawings that indicated the rock rip rap would used to secure the same area of

embankment. Underwater rock riprap provides important interstitial space for a wide variety of aquatic organisms, whereas the ACM will only provide monotypic engineered grade to the depth of 14 feet. We strongly contend that should the need arise to construct this portion of the embankment that the design revert to the designed completed in January, 2005 where some underwater riprap is present.

Response:
We proposed using ACM on the spillways rather than riprap to provide a more environmentally acceptable design. We have considered the feasibility of ending the ACM 5 feet under water and continuing down the slope with riprap. Keying in the ACM on a slope and building downward with riprap could be difficult to construct underwater, it could result in greater disturbance of the adjacent mussel bed, and it could be more costly than using ACM down the slope with riprap to secure it at the toe of the slope. We will examine this issue further during development of the design documentation report.

The underwater portions of the ACM and the large diameter riprap at the toe of the ACM would provide hydraulic roughness. The ACM would be blocks with interstitial spaces between them and holes in them, providing considerable area of hard substrate for attachment of benthic macroinvertebrates and some shelter for small fish. Unlike the larger-sized ACM blocks used on the Lower Mississippi River, the ACM proposed for use at Lock and Dam 3 would have smaller blocks, more roughness, more surface area and more interstitial spaces.

The ACM on the Lower Mississippi River was found to support a diverse community of benthic macroinvertebrates (Way et al. 1995, Wright 1982, Cobb and Magoun 1985 and Lowery et al. 1987). Rock riprap placed for the embankments construction would also support a diverse community of benthic macroinvertebrates and would provide shelter for fish (Anderson et al. 1983).

Because of the limited opportunities to provide functional mitigation features for channel border habitat in a cost effective manner, the amount of bottomland forest restoration was increased to provide out of kind mitigation for the 20 acres of channel border habitat affected by construction. The relative habitat value losses associated with the aquatic habitat were included in the HEP analysis (Table 3 of the Mitigation Plan) and resulted in the need to acquire and restore approximately 93 acres of bottomland hardwood forest.

In addition to the floodplain forest restoration compensatory mitigation, we propose to anchor large woody debris (whole trees) under water along the ACM spillways to provide additional hard substrate, hydraulic diversity and habitat for fish. We will consult with the WDNR and the MnDNR on design of the woody debris installation on the ACM spillways during development of the design documentation report.

Comment:

4. A road extending from the bluff to Gantenbein spillway means a tremendous amount of destruction for inspection reasons. This is unnecessary because inspection is easy from the water, and the lock house is nearby. Water temperature is elevated due to the power plant above the site, making the area ice-free and accessible year-round.

Response:
We do not propose to construct a road or access trail extending from the existing trail to the Gantenbein spillway area unless Phase 2 of the embankments construction in that area becomes necessary. Phase 1 work on the lower embankments will be accessed from the river.

Comment:

5. Alternative N6 states that the Corps has authority to impose wake wave restrictions only in close proximity to locks and dams; as part of the dam structure, the lower embankment may be within that authority. The Corps should consider wake restrictions in that area as an additional measure to prevent erosion.

Response:
Wake wave restrictions are already in place in proximity to the lock and dam. Wake wave restrictions in the tailwater area would be difficult for the Corps to enforce and could be unpopular with the many anglers using the tailwater. Local units of government also have the authority to impose wake wave restrictions.

Comment:

6. Small and medium sized equipment and materials will come in via land and the larger material quantities and large equipment will arrive by water. The size of the staging area must be clearly stated and delineated, and kept to a minimum size.

Response:
We will work with the WDNR and the landowners to identify and delineate appropriate construction staging areas during development of the design documentation report, and we will keep them to the minimum size needed.

Comment:
Mitigation

The proposed mitigation is a reasonable replacement for unavoidable habitat losses, and we agree that mitigation for all intended phases, whether built or not, is a desirable way to proceed. With this approach it is more likely that large contiguous tracts of land will be restored and delays in future stages of the project will be minimized.

Land acquisition may be difficult so all parcels must be in federal ownership prior to any construction. The Wisconsin DNR will likely take over management of the land for a wildlife area with two caveats:

1. A land transfer to the State of Wisconsin must be approved by the Natural Resources Board.

2. Or, if the Corps retains the property while the Wisconsin DNR provides management, the terms would need to be expressed in a Memorandum of Understanding between the DNR and Corps.

Response:
We are required and intend to do the real estate acquisition and implement floodplain forest restoration for mitigation before or concurrently with construction. We do not have the authority or the funding to do any real estate work prior to having an approved report and funding for construction. We would welcome the WDNR to enter into a real estate outgrant agreement with the Corps for management of the land acquired for mitigation.

References

Anderson, D. D., D. B. Wilcox, and D. R. McConville. 1983. Physical and Biological Investigations of the Main Channel Border Habitat of Pool 5a on the Upper Mississippi River in 1980. 2 vols. U.S. Army Corps of Engineers, St. Paul District, St. Paul, Minnesota. 251 p.

Cobb, S.P. and A.D. Magoun. 1995. Physical and Hydrologic Characteristics of Aquatic Habitat Associated with Dike Systems in the Lower Mississippi River, River Mile 320 to 610. Lower Mississippi River Environmental Program, Report 5, Mississippi River Commission, Vicksburg, Mississippi.

Lowry, D. R., M.P. Taylor, R.L. Warden and F.H. Taylor. 1987. Fish and Benthic Communities at Eight Lower Mississippi River Flood-Plain Lakes. Lower Mississippi River Environmental Program, Report 6, Mississippi River Commission, Vicksburg, Mississippi.

Way, C.M., A.J. Burky, C.R. Bingham, and A.C. Miller. 1995. Substrate Roughness, Velocity Refuges, and Macroinvertebrate Abundance on Artificial Substrates in the Lower Mississippi River**.** Journal of the North American Benthological Society*,* Vol. 14, No. 4, pp. 510-518.

Minnesota Department of Natural Resources

500 Lafayette Road
St. Paul, Minnesota 55155-40__

October 6, 2006

Mr. Daniel Wilcox, CEMVP-PM-E
St. Paul District, U.S. Army Corps of Engineers
190 Fifth Street E., Suite 401
St. Paul, MN 55101

Re: Draft Integrated General Reevaluation Report and Environmental Impact Statement for Lock And Dam 3 Mississippi River Navigation Safety and Embankments (GRR & EIS)

Dear Mr. Wilcox:

The Minnesota Department of Natural Resources (MDNR) has reviewed the above referenced project, located in Goodhue County Minnesota and Pierce County Wisconsin, and is providing the following comments regarding the GRR & EIS for your consideration.

MDNR has actively participated in the reevaluation study, which commenced in May 2000. We have provided formal comment directly and in cooperation with the Wisconsin Department of Natural Resources (WDNR) and U.S. Fish and Wildlife Service (USFWS). The current and previous study initiatives concerning safety and embankment issues at this location have been the subject of a number of stakeholder meetings, planning sessions and site field tours that MDNR staff have consistently attended, and for which we have provided our agency perspective.

We are in general agreement with the planning objectives, alternative analysis, and selected plan for addressing safety and embankment issues at Lock and Dam 3. It is our determination that there is consensus among study participants for the need to address the navigation safety and embankment issues at Lock and Dam 3. The selected combination plan N6E5 will address those problems by reducing the chance for navigation accidents and embankment failure. We agree with the N6 – Extended Guide Wall with Channel Modifications portion of the plan, and with the upstream segment of E5 – Strengthen Embankments with Phased Construction.

We have further determined that the planning objectives (improve navigation safety; reduce risk of embankment failure; and protect the river ecosystem) can be better met with the selected alternative if the proposed Embankment Phase 1 can be divided into a number of discrete steps. These steps would stage the Phase 1 embankment construction plan and more effectively meet the study objective - ***protecting the river environment.***

We assume that staged implementation would occur through an adaptive management process, and in consultation with other regulatory agencies. It is our opinion that implementation by stages has strong potential for reducing total project cost and environmental impacts. These significant benefits would occur as a result of reducing project footprint, aquatic and terrestrial habitat loss, and aesthetic and recreational opportunity impairment.

In the following section, we discuss embankment project impacts that are not addressed within the draft GRR & EIS, and that should receive appropriate analysis within the final document. The impacts we identify, from construction of the currently proposed downstream embankments, establish the basis for our recommendations for Phase 1 staging and related mitigation needs.

Impacts From Raised Embankment/Marsh & Gantenbein Lake Spillways

We disagree with statements made in sections 7.2.6 and 7.2.8 that suggest impacts to aquatic biota and fishing opportunities will be minimal. These statements are not supported by scientific observation or literature in the draft document, and in fact are contrary to the body of knowledge regarding fish habitat use in the Upper Mississippi River System. The existing shoreline in the areas of the proposed Marsh Lake and Gantenbein Lake spillways currently provides diverse fish habitat at a variety of river stages. The hydraulic "roughness" and diversity of substrates on the existing shoreline are critical staging areas for fish during high discharge. Likewise these areas are important habitats for anglers and are fished extensively during certain river conditions. Replacing the existing habitat with spillways constructed with articulated concrete mat (ACM) will reduce habitat diversity and thereby diminish fishing opportunities.

Several ongoing monitoring programs (e.g., Long Term Resource Monitoring Program, Xcel Energy, MDNR and WDNR) and agency reports detail fish abundance, habitat use, and angler use in the project area. These data should be referenced in the GRR & EIS, used to define existing conditions and potential consequences of the project, and used as a template for potential mitigation requirements.

We suggest the length and/or alignment of the raised embankment be reconfigured to reduce the loss of important riparian habitats. As currently designed, the landward extension of the 400 foot raised embankment at the Wisconsin end of Lock and Dam 3 will directly result in the loss of marsh and floodplain forest habitat. The design location for the new Marsh Lake spillway relocates the left descending bank to the north to meet the end of the 400 foot raised embankment at a right angle. Excavation to move the existing shoreline, and to create the landward 100-foot wide berm for the spillway eliminates most of the marsh and forested habitat between the river and Marsh Lake.

This also creates an expanded, squared-off, open water area. The corner created will become an area of deposition and subsequent scour with changing river discharges and will not conform to the more natural and stable eddy patterns that have historically existed at each end of the roller gates.

The spillway ACM also eliminates 400 feet of natural and riprap shoreline and existing marshy overflow sloughs at the upstream and downstream ends. The underwater portion of the ACM stream bank will become a flat, undifferentiated plane to a depth of 16 feet. The lower 2 feet will be keyed in and stabilized with rock. With both the Marsh and 2,100-foot Gantenbein Lake spillways constructed with ACM, there will be a significant loss of aquatic habitat. Productive shoreline/littoral area with coarse substrates, woody debris, and irregular contours will be eliminated over a distance of 2,500 feet. The GRR & EIS needs to assess the hydrological, physical, and biological considerations of this project feature to address our concerns for embankment and spillway impacts and effects to the fishery and other aquatic resources. At minimum, the following characteristics of the proposed spillways with ACM should be described:

- Comparative roughness coefficient, bottom velocity, increased velocity throughout the water column.
- Major loss of substrate surface area for primary and secondary productivity; shelter/cover for crayfish and other macroinvertebrates; foraging and spawning habitat for principal game fish species and other important fish community components; and foraging habitat for furbearers and aquatic related bird species.
- Loss of select eagle perching trees for foraging and roosting along the lower embankment.
- Literature search for studies that assess ACM fish use compared to natural or rocked shorelines.
- Habitat loss to a very high profile and important tailwater fishery.

The COE should also consider utilizing available equipment (hydroacoustics, acoustic Doppler current profiler, multi-beam echo sounder, etc.) onboard the M/V Boyer (or similar vessel) to accurately describe existing habitat conditions and analyze existing use of these habitats by fish.

MDNR Recommended Stages For Phase 1 Embankments

In developing the following recommendations, we have identified four implementation stages that will meet the project objectives, utilize USACE engineering specifications, and provide design assurance. All stages assume construction of the 862-foot guide wall with channel modifications as a related project element. We are requesting refinements within the selected embankment plan (Alternative E5) rather than proposing a new plan

alternative. We see the proposed staging as the best means for addressing the established procedural guidelines (Appendix J - Introduction) that require the project to *avoid and minimize environmental impacts*. We support the Corps commitment to protecting the environment by fully mitigating for project construction, operation and maintenance.

Stage 1: Strengthen Upstream and Downstream Embankments

- Reconstruct the upstream spot dikes to alternative E5 specifications.
- Construct the Gantenbein Lake water control structure with a weir run-out elevation of 671.0 ft.
- Restore a narrow earthen berm landward from the existing riprap that separates the river from the southeast corner of Gantenbein Lake.
- Repair all historical riprap projects along the lower embankments to Corps specifications.

It is our assessment that this Stage 1 configuration meets all of the stated main objectives for the project. It protects the river environment by avoiding impacts, while reducing the risk of embankment failure.

Stage 2: Construct the Raised Embankment and Marsh Lake Spillway

- Construct a realigned raised embankment at the dam that effectively moves the upstream end of the Marsh Lake Spillway closer to the existing shoreline. The raised embankment would terminate at the point where it intersects the existing raised embankment that extends upstream from the dam.
- Construct the Marsh Lake spillway with sheet pile and rock utilizing the same design specifications as the upstream spot dikes. To avoid the loss of floodplain forest and marsh, the access road is not included.
- Reconstruct Marsh Lake outlet structure to the same water level management capability as the original structure (el. 672.0).

MDNR requests that the Corps include an optional design feature for Phase 1 – Stage 2. This would provide for a second outlet control structure on Gantenbein Lake, and would be located on the lower private roadway/embankment, between the river and bluff. The controlled outlet could be aligned to restore water flow to the adjacent downstream sloughs. These areas are predominantly dry with normal river levels associated with the summer, autumn, and winter periods. Controlled release of water, at specific intervals, could enhance waterfowl usage as well as fish spawning and nursery areas.
The optional controlled outlet can be discussed between study participants during the Detailed Design planning process.

Consideration should also be given to constructing a 200-foot spillway in association with the optional outlet structure. The spillway would be designed to manage water levels to protect the embankments while directing flow to rejuvenate the old sloughs, channels, and associated fish and wildlife habitat in the Trimbelle bottoms. In the following section of our letter, we note these optional design features as potential mitigation for project related impacts to aquatic habitats.

[This construction stage would be implemented if it is demonstrated in the field that the Stage 1 work is performing inadequately.]

Stage 3: Construct Gantenbein Lake Spillway

- Install sheet pile and rock spillway to same design specifications as upstream spot dikes.
- Sheet pile would be driven for a maximum of 2,100 feet along the lower alignment, between Gantenbein Lake and the river.
- To avoid the loss of floodplain forest and marsh, the access road is not included.

[This construction stage would be implemented if it is demonstrated in the field that the Stage 2 work is performing inadequately.]

Stage 4: Articulated Concrete Mat

In the unlikely event of a failure point in the constructed Phase 1 - Stages 1, 2, and 3 embankments, consideration for repair using ACM should be coordinated with WDNR and the landowner.

Phase 2 – Strengthen Embankments

The selected alternative plan N6E5 describes this phase as an adaptive management step to be taken if the embankments left unprotected by Phase 1 fail. Phase 2 includes a considerable length of embankment from lower Marsh Lake and around the lower end of Gantenbein Lake to the bluff. We request that any implementation of this phase be done incrementally to address specific embankment sections.

Mitigation

The GRR & EIS needs to detail mitigation for loss of shoreline, aquatic habitat, and 2,500 feet of tailwater fishing opportunity. Mitigation must include compensatory measures for Minnesota as well as Wisconsin residents because of the considerable

impact to an interstate resource. Mitigation should be relevant to the type of habitat lost, in reasonable proximity to the project, and apparent to a variety of river users.

The mitigation proposed in the GRR & EIS is for purchase of 313 acres of floodplain agricultural land for floodplain forest restoration, with land parcels to be purchased in undetermined locations in the Trimbelle, Isabelle, Mississippi, or Rush River floodplains. Our re-examination of mitigation issues, through the GRR & EIS review, indicates that current mitigation proposals are nonspecific and not in accordance with expectations expressed in the preceding paragraph. Compensatory measures should be focused more directly within the Mississippi River floodplain of the project area, and/or in the Trimbelle floodplain.

Partial mitigation for project impacts to aquatic/wetland resources could be accomplished by modifying the private lower embankment/roadway that extends between the river and bluff. The elevated roadway has blocked normal hydrological patterns that formed and maintained the mosaic of downstream habitats. The low current velocities created have eliminated scour and resulted in sediment infilling of aquatic habitat. We strongly support an alternative that could restore the historic flood flows that extended through the Mero bottoms and terminated at Trenton Slough. This could be effectively addressed by creating a spillway section with a maximum elevation of 674.5. The optional outlet structure included under our Stage 2 recommendations would also provide flows for aquatic habitat management during the extended dry periods of the year.

The floodplain forest mitigation area will require considerable follow-up maintenance and monitoring to assure that the restoration is working as planned. As part of the mitigation plan, a commitment to active management and monitoring should be required for a minimum of 50 years. The mitigation plan references the use of green ash for plantings or seeding. It may be prudent to consider an alternate species for all river restoration projects because of the potential for an invasion of emerald ash borer.

The closure dike that ties the guide wall extension to the riverbank shoreline will eliminate a substantial area of Public Waters. This loss of aquatic habitat will require mitigation. Mitigation will be a requirement of the future Public Waters Permit. The mitigation measures to improve aquatic habitat will be determined during the permitting process.

MDNR agrees that all project mitigation should occur at the same time as project construction. We believe that all real estate transactions necessary to obtain fee title need to be completed prior to any project construction. This is necessary to assure that the wetland or other compensation is truly concurrent with habitat losses that occur during construction.

Additional Comments

1. An accidental drawdown of Pool 3 (page 3-26) would not close down recreational boating. It would negatively impact marinas and large boat owners, but small recreational craft would still be able to operate in deeper portions of the Pool.

2. A Minnesota Public Waters Permit is required for construction of the guide wall extension and dike closure structure, dredging of the new thalweg channel, placement of the dredge material and armoring of the top of the new channel bottom with rock riprap in those locations that are within Minnesota.

3. Location of the staging area and avoidance and minimization measures for construction of the upstream spot dikes is not referenced in the draft document.

4. Alternative NN3- *Restrict Navigation* should be retained. In a letter dated October 18, 2001, MDNR Commissioner Garber expressed our agency's concern that a structural solution was in the distant future and advocated that a nonstructural solution be put in place as soon as possible. In response, the Corps cited the River Process Action Plan (predecessor to the Waterway Action Plan) as a possible solution that would voluntarily restrict navigation and should get good industry compliance. The voluntary restrictions in the Waterway Action Plan that the GRR & EIS references are linked to a web page that is password protected. The password protection prevents the MDNR from assessing the plan's adequacy in reducing the navigation risk associated with high discharge/outdraft conditions. The GRR &EIS provides no measure of voluntary compliance with the Waterway Action Plan. Alternative NN3 must be retained until the commercial navigation industry's volunteer measures and compliance are determined to be adequate by an independent third party.

5. Alternative NN4- *Require Use of Helper Boat* should be pursued in cooperation with the U.S Coast Guard. Emphasis should be for the mandatory use of the private helper boat by tows with hazardous cargo when outdraft conditions are present. Towboat operators estimate that the helper boat prevents 90 percent of accidents that might otherwise occur. Recent articles point out that rapidly expanding ethanol production will likely rely on barge and rail transportation. Both ethanol and ammonia distribute throughout the water column and could cause considerably more impacts to aquatic life than a petroleum spill.

6. The lower embankment staging area proposed for material storage and ACM assembly should be eliminated from the plan by relocating the staging area within the footprint of the construction zone. This would greatly reduce the loss of floodplain forest wetlands associated with the project. Wetland losses must be avoided whenever possible under both federal and state rules.

7. During the project planning process, we were assured that the new Marsh Lake control structure would allow for the same water level management as the original structure. Our information indicates that the bottom invert elevation of the existing Marsh Lake control structure is 672.0. However, the plan sheets for the new Marsh Lake control structure indicate a sheet pile weir run-out elevation of 674.0. If the water control elevation of the new structure is higher than the old, management capabilities for promoting healthy communities of aquatic vegetation would be reduced. The sheet pile weir elevation needs to be adjusted to provide water control capabilities to an elevation of 672.0. With Gantenbein Lake being managed at a 1-foot lower elevation than Marsh Lake, the new Gantenbein Lake outlet structure should have the sheet pile weir run-out elevation at 671.0.

We appreciate the opportunity to comment on the draft GRR & EIS for the navigation safety and embankment issues at Lock and Dam 3. This project constitutes a major public expenditure and, as currently proposed, has significant environmental and social impacts. We have suggested intermediate steps to avoid and minimize those impacts, which we see as positive steps towards cost, impact, and mitigation reduction. We look forward to your response as part of the final GRR & EIS document, and will plan to work with the Corps and other participants during the Detailed Design Documentation Report phase of the project.

If you should have any questions about MDNR comments, please direct them to Jack Enblom of my staff at 651/259/5091.

Sincerely,

Steven Colvin
Environmental Review Supervisor
Division of Ecological Services

c: Jack Enblom
Scot Johnson
Kevin Stauffer
Mike Tenney
Steven Hirsch
Gretchen Benjamin, WDNR
James Fischer, WDNR
Gary Wege, USFWS

St. Paul District Responses to Minnesota Department of Natural Resources Comments
(letter dated October 6, 2006)

Comment:
The Minnesota Department of Natural Resources (MDNR) has reviewed the above referenced project, located in Goodhue County Minnesota and Pierce County Wisconsin, and is providing the following comments regarding the GRR & EIS for your consideration.

MDNR has actively participated in the reevaluation study, which commenced in May 2000. We have provided formal comment directly and in cooperation with the Wisconsin Department of Natural Resources (WDNR) and U.S. Fish and Wildlife Service (USFWS). The current and previous study initiatives concerning safety and embankment issues at this location have been the subject of a number of stakeholder meetings, planning sessions and site field tours that MDNR staff have consistently attended, and for which we have provided our agency perspective.

We are in general agreement with the planning objectives, alternative analysis, and selected plan for addressing safety and embankment issues at Lock and Dam 3. It is our determination that there is consensus among study participants for the need to address the navigation safety and embankment issues at Lock and Dam 3. The selected combination plan N6E5 will address those problems by reducing the chance for navigation accidents and embankment failure. We agree with the N6 - Extended Guide Wall with Channel Modifications portion of the plan, and with the upstream segment of E5 – Strengthen Embankments with Phased Construction.

We have further determined that the planning objectives (improve navigation safety; reduce risk of embankment failure; and protect the river ecosystem) can be better met with the selected alternative if the proposed Embankment Phase 1 can be divided into a number of discrete steps. These steps would stage the Phase 1 embankment construction plan and more effectively meet the study objective -protecting the river environment.

We assume that staged implementation would occur through an adaptive management process, and in consultation with other regulatory agencies. It is our opinion that implementation by stages has strong potential for reducing total project cost and environmental impacts. These significant benefits would occur as a result of reducing project footprint, aquatic and terrestrial habitat loss, and aesthetic and recreational opportunity impairment.

Response:
See our responses to MnDNR recommendations on phased construction below.

Comment:
In the following section, we discuss embankment project impacts that are not addressed within the draft GRR & EIS, and that should receive appropriate analysis within the final document. The impacts we identify, from construction of the currently proposed downstream embankments, establish the basis for our recommendations for Phase 1 staging and related mitigation needs.

Impacts From Raised Embankment Marsh & Gantenbein Lake Spillways
We disagree with statements made in sections 7.2.6 and 7.2.8 that suggest impacts to aquatic biota and fishing opportunities will be minimal. These statements are not supported by scientific observation or literature in the draft document, and in fact are contrary to the body of knowledge regarding fish habitat use in the Upper Mississippi River System. The existing shoreline in the areas of the proposed Marsh Lake and Gantenbein Lake spillways currently provides diverse fish habitat at a variety of river stages. The hydraulic "roughness" and diversity of substrates on the existing shoreline are critical staging areas for fish during high discharge. Likewise these areas are important habitats for anglers and are fished extensively during certain river conditions. Replacing the existing habitat with spillways constructed with articulated concrete mat (ACM) will reduce habitat diversity and thereby diminish fishing opportunities.

Response:
The channel border aquatic habitat along the left descending bank below Lock and Dam 3 is a historically disturbed area. The shoreline was graded and riprapped during dam construction in 1937. Since then, the shoreline has eroded back, narrowing the lower embankment isthmus between the Gantenbein Lakes and the river (EIS Figure 3-9). The old riprap has largely disappeared into the tailwater. The area close to the lock and dam and along the length of the lower embankment and at the south end of Gantenbein Lake was severely scoured during the 1993 navigation accident that resulted in overtopping of the Wisconsin embankments when there was about 4 feet of head at the dam (EIS Figure 3-10). The channel border area downstream of the dam has eroded landward, leaving a sandy bench with a shoreline erosion scarp with exposed tree roots. Many floodplain trees along that shoreline have been lost to erosion and wind throw. The higher velocities in that area have swept most of the woody debris away, leaving a relatively homogeneous area without much hydraulic roughness. Fish have access to the irregularities of the present bank line and the emerging woody debris during higher levels of river discharge.

The raised embankment area near the dam would be armored with large diameter riprap. The spillway areas would have ACM extending to the toe of the bank slope under water and would be anchored with large diameter riprap there. The areas near the Marsh Lake and the Gantenbein Lake water control structures would also be armored with riprap.

We proposed using ACM on the spillways rather than riprap to provide a more environmentally acceptable design. We have considered the feasibility of ending the ACM 5 feet under water and continuing down the slope with riprap. Keying in the ACM on a slope and building downward with riprap could be difficult to construct underwater, it could result in greater disturbance of the adjacent mussel bed, and it could be more costly than using ACM down the slope with riprap to secure it at the toe of the slope. We will examine this design issue further during development of the design documentation report.

The underwater portions of the ACM and the large diameter riprap at the toe of the ACM would provide hydraulic roughness. The ACM would be blocks with interstitial spaces between them and holes in them, providing considerable area of hard substrate for attachment of benthic macroinvertebrates and some shelter for small fish. Unlike the larger-sized ACM blocks used on the Lower Mississippi River, the ACM proposed for use at Lock and Dam 3 would have smaller blocks, more roughness, more surface area and more interstitial spaces.

The ACM on the Lower Mississippi River was found to support a diverse community of benthic macroinvertebrates (Way et al. 1995, Wright 1982, Cobb and Magoun 1985 and Lowery et al. 1987). Rock riprap placed for the embankments construction would also support a diverse

community of benthic macroinvertebrates and would provide shelter for fish (Anderson et al. 1983).

Because of the limited opportunities to provide functional mitigation features for channel border habitat in a cost effective manner, the amount of bottomland forest restoration was increased to provide out of kind mitigation for the 18.8 acres of channel border habitat affected by construction. The relative habitat value losses associated with the aquatic habitat was included in the HEP analysis (Table 3 of the Mitigation Plan) and resulted in the need to acquire and restore approximately 93 acres of bottomland hardwood forest.

In addition to the floodplain forest restoration compensatory mitigation, we propose to anchor large woody debris (whole trees) under water along the ACM spillways to provide additional hard substrate, hydraulic diversity and habitat for fish. We will consult with the WDNR and the MnDNR on design of the woody debris installation on the ACM spillways during development of the design documentation report.

Comment:
Several ongoing monitoring programs (e.g., Long Term Resource Monitoring Program, Xcel Energy, MDNR and WDNR) and agency reports detail fish abundance, habitat use, and angler use in the project area. These data should be referenced in the GRR & EIS, used to define existing conditions and potential consequences of the project, and used as a template for potential mitigation requirements.

Response:
We agree that a wealth of scientific reports and data sets exists for the Pool 3 and Upper Pool 4 reach of the Upper Mississippi River. In the interest of brevity, we referenced several synthesis reports that cover the study area in Section 4 of the draft report: Collinsworth et al. 1973, Miller et al. 1973, WEST 2000, Corps of Engineers 1995a, Corps of Engineers 1995b, Corps of Engineers 2000b, Fish and Wildlife Work Group 2004, Dieterman 1995, and USGS 1998. We added information about existing conditions in the study area to the report in Section 4.1.7.2 and provided additional references.

Our reference for mitigation was the forecasted future conditions in the area affected by the embankments construction as described in the Mitigation Plan. The land cover data used in the mitigation analysis were referenced as Long-Term Resource Monitoring Program (LTRMP) data.

We added estimates of sediment resuspension during the dredging and material placement for channel modifications using LTRMP water quality data.

Comment:
We suggest the length and/or alignment of the raised embankment be reconfigured to reduce the loss of important riparian habitats. As currently designed, the landward extension of the 400 foot raised embankment at the Wisconsin end of Lock and Dam 3 will directly result in the loss of marsh and floodplain forest habitat. The design location for the new Marsh Lake spillway relocates the left descending bank to the north to meet the end of the 400 foot raised embankment at a right angle. Excavation to move the existing shoreline, and to create the landward 100-foot wide berm for the spillway eliminates most of the marsh and forested habitat between the river and Marsh Lake.

Response:

The gated part of the dam needs to be protected from failure by scour such as nearly occurred during the 1993 navigation accident. That protection requires a raised embankment near the dam for 400 feet. The alignment of the raised embankment follows the former shoreline. The raised embankment section would be riprapped. The existing habitat in that area is disturbed floodplain forest, having been subjected to scour during overtopping events and disturbed by construction during emergency embankment repairs. The Marsh Lake spillway would need to be 400 feet long to provide hydraulic capacity for overflow between Marsh Lake and the river. We have assessed the unavoidable impacts of construction to significant resources in that area and have accounted for those impacts in the mitigation plan.

Comment:
This also creates an expanded, squared-off, open water area. The corner created will become an area of deposition and subsequent scour with changing river discharges and will not conform to the more natural and stable eddy patterns that have historically existed at each end of the roller gates.

Response:
The alignment of the raised embankment and the Marsh Lake spillway follows the former shoreline, around a deep scour hole. Although the artist's rendition of the future appearance of the lower embankment in the report may indicate a square corner near the dam, we refer to the drawings (see the plates on the computer disc provided with the report). We will work with the MnDNR, the WDNR and the USFWS on details of the embankments alignment during preparation of the design documentation report.

Comment:
The spillway ACM also eliminates 400 feet of natural and riprap shoreline and existing marshy over flow sloughs at the upstream and downstream ends.

Response:
The Marsh Lake spillway would need to be 400 feet long to provide hydraulic capacity for overflow between Marsh Lake and the river. We have assessed the unavoidable impacts of construction on significant resources in that area and have accounted for those impacts in the mitigation plan.

Comment:
The underwater portion of the ACM stream bank will become a flat, undifferentiated plane to a depth of 16 feet. The lower 2 feet will be keyed in and stabilized with rock. With both the Marsh and 2,100-foot Gantenbein Lake spillways constructed with ACM, there will be a significant loss of aquatic habitat. Productive shoreline/littoral area with coarse substrates, woody debris, and irregular contours will be eliminated over a distance of 2,500 feet. The GRR & EIS needs to assess the hydrological, physical, and biological considerations of this project feature to address our concerns for embankment and spillway impacts and effects to the fishery and other aquatic resources. At minimum, the following characteristics of the proposed spillways with ACM should be described:

- Comparative roughness coefficient, bottom velocity, increased velocity throughout the water column.
- Major loss of substrate surface area for primary and secondary productivity; shelter/cover for crayfish and other macroinvertebrates; foraging and spawning habitat for principal game fish species and other important fish community components; and foraging habitat for furbearers and aquatic related bird species.

- Loss of select eagle perching trees for foraging and roosting along the lower embankment.
- Literature search for studies that assess ACM fish use compared to natural or rocked shorelines.
- Habitat loss to a very high profile and important tailwater fishery.

Response:
See response to comments above. We have expanded upon the description of the effects of the embankments construction on channel border habitat in the EIS Section 7.1.10.

Comment:
The COE should also consider utilizing available equipment (hydroacoustics, acoustic Doppler current profiler, multi-beam echo sounder, etc.) onboard the MIV Boyer (or similar vessel) to accurately describe existing habitat conditions and analyze existing use of these habitats by fish.

Response:
We added description of hydroacoustic fish and ADCP surveys already conducted near the Lock and Dam 3 to the EIS in Section 4.1.7.2.

Comment:
MDNR Recommended Stages For Phase 1 Embankments
In developing the following recommendations, we have identified four implementation stages that will meet the project objectives, utilize USACE engineering specifications, and provide design assurance. All stages assume construction of the 862-foot guidewall with channel modifications as a related proiect element. We are requesting refinements within the selected embankment plan (Alternative E5) rather than proposing a new plan alternative. We see the proposed staging as the best means for addressing the established procedural guidelines (Appendix J - Introduction) that require the project to *avoid and minimize environmental impacts.* We support the Corps commitment to protecting the environment by fully mitigating for project construction, operation and maintenance.

Stage 1 : Strengthen Upstream and Downstream Embankment
- Reconstruct the upstream spot dikes to alternative E5 specifications.
- Construct the Gantenbein Lake water control structure with a weir run-out elevation of 671.0 ft.
- Restore a narrow earthen berm landward from the existing riprap that separates the river from the southeast corner of Gantenbein Lake.
- Repair all historical riprap projects along the lower embankments to Corps specifications.

It is our assessment that this Stage 1 configuration meets all of the stated main objectives for the project. It protects the river environment by avoiding impacts, while reducing the risk of embankment failure.
Response:
The extended guide wall, channel modifications and strengthened spot dikes would lessen the likelihood of a navigation accident and embankment failure that would jeopardize control of Pool 3. Unfortunately, the risk of a gate blockage event (e.g., barges in the dam gates due to a navigation accident or a woody debris jam) remains. The Prairie Island and Allen S. King power plants may be affected by an accidental drawdown of Pool 3. We assessed project alternatives and residual risks in the risk assessment study and found that the most vulnerable portions of

the lower embankment must be protected against a gate blockage event, which would cause high head and high velocity conditions along the lower embankment. Riprap is not sufficient to withstand the high velocities associated with a gate blockage event; ACM is proposed. As stated in the report, the Corps agrees that portions of the lower embankment are sufficiently strong at this time and can be left for a second stage of construction that would occur only after additional erosion of those portions of the lower embankment, but some risk is associated with leaving those portions of the embankment until a later time. The proposed work along the spot dike alignment is partly in response to the risk associated with not improving portions of the lower embankment (the spot dike work is also partly in response to degradation that has occurred along the spot dike alignment).

We will construct all features of the Phase 1 embankments construction as described in Alterative E5 in the draft GRR/EIS. All features are needed in combination to have an embankment system that can resist the forces of overtopping, seepage, concentration of flow by woody debris, wave action and river currents. Construction scheduling will be contingent on available funding. We will work closely with the MnDNR, the WDNR, the USFWS, and the landowners on the construction schedule in development of the design documentation report and plans and specifications.

The current lowest outlet elevation for Gantenbein Lake is approximately 673.7 feet. The source of this information is explained in section 17.b of the Hydraulic Appendix H. The proposed outlet structure for Gantenbein Lake has a weir elevation of 673.0 feet, which is lower than the existing outlet elevation and, therefore, provides greater water level management capability than the existing condition for Gantenbein Lake.

Comment:
Stage 2: Construct the Raised Embankment and Marsh Lake Spillway

- Construct a realigned raised embankment at the dam that effectively moves the upstream end of the Marsh Lake Spillway closer to the existing shoreline. The raised embankment would terminate at the point where it intersects the existing raised embankment that extends upstream from the dam.

Response:
We will consult with the WDNR, MnDNR, USFWS and landowners on the alignment and details of the design of the raised embankment and Marsh Lake spillway during development of the design documentation report.

Comment:
- Construct the Marsh Lake spillway with sheet pile and rock utilizing the same design specifications as the upstream spot dikes. To avoid the loss of floodplain forest and marsh, the access road is not included.

Response:
The large amount of flow that would pass through Marsh Lake to the Mississippi River will require a spillway that would withstand overtopping as well as wave action and river currents and be resistant to seepage and undermining. An ACM spillway is needed. The spot dike sheet pile and riprap design would not suffice. An access road around the south end of Gantenbein Lake is not proposed as part of the phase 1 embankments construction. Work on the lower embankment would be accessed from the river. A 10-foot-wide one-lane access trail

is proposed as part of the phase 1 work on the upper embankment to enable construction access and for later inspection and maintenance activities.

Comment:

- Reconstruct Marsh Lake outlet structure to the same water level management capability as the original structure (el. 672.0).

Response:
The existing Marsh Lake outlet water control structure that is still functional has an invert elevation of approximately 669.0 feet. The approach channel to the structure has filled with sediment and the landowners have only been able to regulate Marsh Lake water levels between elevation 674.0 feet and 675.2 feet for many years. We would set the upstream weir on the Marsh Lake outlet structure at elevation 673.0 feet and excavate the jnlet channel into Marsh Lake. We will discuss this design issue further with the landowners, WDNR, and MnDNR during development of the design document report.

Comment:
MDNR requests that the Corps include an optional design feature for Phase 1 - Stage 2. This would provide for a second outlet control structure on Gantenbein Lake, and would be located on the lower private roadway/embankment, between the river and bluff. The controlled outlet could be aligned to restore water flow to the adjacent downstream sloughs. These areas are predominantly dry with normal river levels associated with the summer, autumn, and winter periods. Controlled release of water, at specific intervals, could enhance waterfowl usage as well as fish spawning and nursery areas. The optional controlled outlet can be discussed between study participants during the Detailed Design planning process.

Consideration should also be given to constructing a 200-foot spillway in association ith the optional outlet structure. The spillway would be designed to manage water levels to protect the embankments while directing flow to rejuvenate the old sloughs, channels, and associated fish and wildlife habitat in the Trimbelle bottoms. In the following section of our letter, we note these optional design features as potential mitigation for project related impacts to aquatic habitats.

[This construction stage would be implemented if it is demonstrated in the field that the Stage 1 work is performing inadequately.]

Response:
We do not have the authority or funding for ecosystem restoration features, such as another controlled outlet water structure for Gantenbein Lake, for this project. Another overflow section at the south end of Gantenbein Lake could be part of a phase 2 of the embankments construction, if needed. We will discuss this option during development of the detailed design memorandum. It could be part of a Phase 2 of the embankments construction if needed. We do not consider this a part of the mitigation plan.

Comment:
Stage 3: Construct Gantenbein Lake Spillway

- Install sheet pile and rock spillway to same design specifications as upstream spot dikes.
- Sheet pile would be driven for a maximum of 2,100 feet along the lower alignment, between Gantenbein Lake and the river.
- To avoid the loss of floodplain forest and marsh, the access road is not included.

[This construction stage would be implemented if it is demonstrated in the field that the Stage 2 work is performing inadequately.]

Stage 4: Articulated Concrete Mat
In the unlikely event of a failure point in the constructed Phase 1 - Stages 1,2, and 3 embankments, consideration for repair using ACM should be coordinated with WDNR and the landowner.

Response:
The large amount of flow that would pass between Gantenbein Lake and the river will require a spillway that would withstand overtopping as well as wave action and river currents and be resistant to seepage and undermining. The spot dike sheet pile and riprap design would not suffice. An ACM spillway is needed.

We do not propose to extend the access trail around the south end of Gantenbein Lake to the river during the Phase 1 construction.

Comment:
Phase 2 - **Strengthen Embankments**
The selected alternative plan N6E5 describes this phase as an adaptive management step to be taken if the embankments left unprotected by Phase 1 fail. Phase 2 includes a considerable length of embankment from lower Marsh Lake and around the lower end of Gantenbein Lake to the bluff. We request that any implementation of this phase be done incrementally to address specific embankment sections.

Response:
The embankments would be inspected regularly and after overtopping events. If breaches through the unprotected areas were to occur, Phase 2 segments of the lower embankment would be built as needed. It may not be necessary to construct all the Phase 2 parts of the lower embankment. The extent of the construction will be determined in consultation with the landowners, WDNR, MnDNR and USFWS.

Comment:
Mitigation
The GRR & EIS needs to detail mitigation for loss of shoreline, aquatic habitat, and 2,500 feet of tailwater fishing opportunity. Mitigation must include compensatory measures for Minnesota as well as Wisconsin residents because of the considerable impact to an interstate resource. Mitigation should be relevant to the type of habitat lost, in reasonable proximity to the project, and apparent to a variety of river users.

The mitigation proposed in the GRR & EIS is for purchase of 313 acres of floodplain agricultural land for floodplain forest restoration, with land parcels to be purchased in undetermined locations in the Trimbelle, Isabelle, Mississippi, or Rush River floodplains. Our re-examination of mitigation issues, through the GRR & EIS review, indicates that current mitigation proposals are nonspecific and not in accordance with expectations expressed in the preceding paragraph. Compensatory measures should be focused more directly within the Mississippi River floodplain of the project area, and/or in the Trimbelle floodplain.

Response:

Because of the limited opportunities to provide functional mitigation features for channel border habitat in a cost effective manner, the amount of bottomland forest restoration was increased to provide out of kind mitigation for the 20 acres of channel border habitat affected by embankments construction. The relative habitat value losses associated with the aquatic habitat was included in the HEP analysis (Table 3 of the Mitigation Plan) and resulted in the need to acquire and restore approximately 93 acres of bottomland hardwood forest.

In addition to the floodplain forest restoration compensatory mitigation, we propose to anchor large woody debris (whole trees) under water along the ACM spillways to provide additional hard substrate, hydraulic diversity and habitat for fish. We will consult with the WDNR and the MnDNR on design of the woody debris installation on the ACM spillways during development of the design documentation report.

We implement compensatory environmental mitigation in the same State where the construction occurs. We cannot identify specific mitigation land to acquire at this time, lacking an approved report and funding to construct. Identification of specific properties for acquisition at this time could jeopardize future real estate negotiations. In the mitigation plan, we state that we intend to acquire mitigation land in floodplain areas nearby in Pierce County, Wisconsin, that are in need of restoration. If suitable property is available from willing sellers in the Mississippi River floodplain near the project area, then that may be acquired.

Comment:
Partial mitigation for project impacts to aquatic/wetland resources could be accomplished by modifying the private lower embankment/roadway that extends between the river and bluff. The elevated roadway has blocked normal hydrological patterns that formed and maintained the mosaic of downstream habitats. The low current velocities created have eliminated scour and resulted in sediment infilling of aquatic habitat. We strongly support an alternative that could restore the historic flood flows that extended through the Mero bottoms and terminated at Trenton Slough. This could be effectively addressed by creating a spillway section with a maximum elevation of 674.5. The optional outlet structure included under our Stage 2 recommendations would also provide flows for aquatic habitat management during the extended dry periods of the year.

Response:
We agree that restoring flow through the floodplain south of Gantenbein Lake would be beneficial to habitat there. We cannot, however, propose ecosystem restoration features as part of the Lock and Dam 3 project on private land, lacking the authority and funding to do so. It may be possible to incorporate overflow features into the Phase 2 embankments construction when the need to construct Phase 2 of the embankments occurs in the future.

Comment:
The floodplain forest mitigation area will require considerable follow-up maintenance and monitoring to assure that the restoration is working as planned. As part of the mitigation plan, a commitment to active management and monitoring should be required for a minimum of 50 years. The mitigation plan references the use of green ash for plantings or seeding. It may be prudent to consider an alternate species for all river restoration projects because of the potential for an invasion of emerald ash borer.

Response:

We included monitoring to achieve the floodplain forest restoration objectives for tree stand density and species composition and contingent replanting if needed. We extended the monitoring period to 10 years in the final report and in the Environmental Mitigation Plan (Appendix J). The Corps of Engineers will retain ownership of the mitigation land and will retain responsibility for its management in perpetuity. We may, if the WDNR is interested, transfer routine management responsibilities to the WDNR under a real estate outgrant agreement. The WDNR would then manage the property as a wildlife management area. We are aware of the impending invasion of the emerald ash borer.

Comment:
The closure dike that ties the guide wall extension to the riverbank shoreline will eliminate a substantial area of Public Waters. This loss of aquatic habitat will require mitigation. Mitigation will be a requirement of the future Public Waters Permit. The mitigation measures to improve aquatic habitat will be determined during the permitting process.

Response:
A berm connecting the end of the guide wall with the Minnesota riverbank would fill approximately 1.5 acres. The berm is needed to prevent woody debris from accumulating on the landward side of the extended guide wall. Approximately 0.5 acre of this berm would be emergent above the water, converting aquatic habitat to terrestrial. The area is presently deep high current velocity channel border aquatic habitat in the immediate lock approach with sand bottom and riprapped bank. The side slopes of the berm would be armored with rock. The emergent part of the berm would grow up with willows. The area has little public use except for boaters navigating into or out of the lock.

The pattern of current velocity would be changed by the channel modifications, directing more flow toward the gated part of the dam and reducing velocities in the lock approach. The net effects on channel habitat would be to convert 17 acres of deep channel high current velocity sand bottom habitat to deep channel rock bottom habitat with somewhat lower current velocities. The 17 acres of rock substrate in the lock approach would provide hard substrate for crayfish and a variety of filter-feeding macroinvertebrates like Hydropsychid caddisflies, which are important fish food organisms. Production of macroinvertebrates is expected to increase. The rock substrate would provide microhabitat shelter from the current for fish like darters, catfish, rock bass and smallmouth bass. Extensive mussel surveys in the project area found very few native mussels.

Avoid and minimize measures would include dredging and rock placement to be done during the non-navigation season to limit disturbace to walleye and sauger that spawn in the tailwater in the spring.

Because no unavoidable losses of significant resources would result, and because the channel modifications would increase production of benthic macroinvertebrates in the area and provide habitat for fish, no compensatory mitigation is proposed for the navigation safety improvement portion of the project.

Comment:
MDNR agrees that all project mitigation should occur at the same time as project construction. We believe that all real estate transactions necessary to obtain fee title need to be completed prior to any project construction. This is necessary to assure that the wetland or other compensation is truly concurrent with habitat losses that occur during construction.

Response:
We are required and intend to do the real estate acquisition and implement floodplain forest restoration for mitigation before or concurrently with construction. We do not have the authority or the funding to do any real estate work prior to having an approved report and funding for construction.

Additional Comments:
1. An accidental drawdown of Pool 3 (page 3-26) would not close down recreational boating. It would negatively impact marinas and large boat owners, but small recreational craft would still be able to operate in deeper portions of the Pool.

Response:
An embankment failure at Lock and Dam 3 could result in an accidental drawdown of 3 to 6 feet at the dam. For purposes of this study, we used a drawdown of 5 feet at the dam as an expected value. Recreational boating on upper Pool 3 near Prescott, Wisconsin, and on the St. Croix River could probably continue during an accidental drawdown, but boating on lower Pool 3 would be hazardous. Depending on the controlling depth in harbor entrances, larger and deeper draft vessels could be confined to marinas as the result of an accidental drawdown.

Response:
2. A Minnesota Public Waters Permit is required for construction of the guide wall extension and dike closure structure, dredging of the new thalweg channel, placement of the dredge material and armoring of the top of the new channel bottom with rock riprap in those locations that are within Minnesota.

Response:
We will apply for a Minnesota Public Waters Permit for the Lock and Dam 3 project out of comity.

Comment:
3. Location of the staging area and avoidance and minimization measures for construction of the upstream spot dikes is not referenced in the draft document.

Response:
A staging area for construction of the spot dikes will not be needed. The work will be accessed from land via a one-lane trail. We mention avoid and minimize measures to protect cultural resources in the parking/turning area at the base of the bluff in Section 7.1.8. These measures were coordinated with the Wisconsin State Historic Preservation Officer. We would install silt curtains in the spot dike channels to limit sediment movement into the river and Marsh Lake during construction.

Comment:
4. Alternative NN3- *Restrict Navigation* should be retained. In a letter dated October 18, 2001, MDNR Commissioner Garber expressed our agency's concern that a structural solution was in the distant future and advocated that a nonstructural solution be put in place as soon as possible. In response, the Corps cited the River Process Action Plan (predecessor to the Waterway Action Plan) as a possible solution that would voluntarily restrict navigation and should get good industry compliance. The voluntary restrictions in the Waterway Action Plan that the GRR & EIS references are linked to a web page that is password protected. The password protection prevents the MDNR from assessing the plan's adequacy in reducing the navigation 'risk associated with high discharge/loutdraft conditions. The GRR &EIS provides no

measure of voluntary compliance with the Waterway Action Plan. Alternative NN3 must be retained until the commercial navigation industry's volunteer measures and compliance are determined to be adequate by an independent third party.

Response:
We assessed the potential effectiveness of restrictions on navigation during outdraft conditions (fewer barges per tow). Although smaller tows may be more maneuverable, the resulting larger number of tows would offset risk reduction.

The Waterway Action Plan is a public document available on-line and in hard copy from the U.S. Coast Guard. That plan has only been in place since earlier this year. We monitor navigation accidents at Lock and Dam 3 (Table 3.1 in the GRR/EIS), but it will take years of experience to determine the effectiveness of the Waterway Action Plan.

Comment:
5. Alternative NN4- *Require Use of Helper Boat* should be pursued in cooperation with the U.S Coast Guard. Emphasis should be for the mandatory use of the private helper boat by tows with hazardous cargo when outdraft conditions are present. Towboat operators estimate that the helper boat prevents 90 percent of accidents that might otherwise occur. Recent articles point out that rapidly expanding ethanol production will likely rely on barge and rail transportation. Both ethanol and ammonia distribute throughout the water column and could cause considerably more impacts to aquatic life than a petroleum spill.

Response:
We agree that it would be prudent to pursue increased use of a helper boat by down bound tows during outdraft conditions as an interim measure. We modified the report to retain the "Require Helper Boat Use" alternative and included the following statement:

> As an interim measure until navigation safety improvements are constructed, the St. Paul District will pursue complete voluntary compliance by the towing industry for helper boat use during outdraft conditions (river discharge greater than 21,000 cfs) for down bound tows approaching Lock and Dam 3 with six or more loaded barges.

The towing industry is acutely aware of the consequences and costs of navigation accidents and accidental spills of cargo. They are also responsible for the costs of spill response and cleanup.

Comment:
6. The lower embankment staging area proposed for material storage and ACM assembly should be eliminated from the plan by relocating the staging area within the footprint of the construction zone. This would greatly reduce the loss of floodplain forest wetlands associated with the project. Wetland losses must be avoided whenever possible under both federal and state rules.

Response:
We agree with the need to minimize the footprint of construction staging areas. Work on the lower embankment will be accessed from the water. We will work with the MnDNR, WDNR, USFWS, and landowners on layout of construction staging areas during development of the design documentation report.

Comment:

7. During the project planning process, we were assured that the new Marsh Lake control structure would allow for the same water level management as the original structure. Our information indicates that the bottom invert elevation of the existing Marsh Lake control structure is 672.0. However, the plan sheets for the new Marsh Lake control structure indicate a sheet pile weir run-out elevation of 674.0. If the water control elevation of the new structure is higher than the old, management capabilities for promoting healthy communities of aquatic vegetation would be reduced. The sheet pile weir elevation needs to be adjusted to provide water control capabilities to an elevation of 672.0. With Gantenbein Lake being managed at a 1 -foot lower elevation than Marsh Lake, the new Gantenbein Lake outlet structure should have the sheet pile weir run-out elevation at 671.0.

Response:
The existing Marsh Lake outlet water control structure that is still functional has an invert elevation of approximately 669.0 feet. The approach channel to the structure has filled with sediment, and the landowners have only been able to regulate Marsh Lake water levels between elevation 674.0 feet and 675.2 feet for many years. We would set the upstream weir on the Marsh Lake outlet structure at elevation 673.0 feet and excavate the jnlet channel into Marsh Lake. We will discuss this issue further with the landowners, WDNR, and MnDNR during preparation of the design document report.

References

Anderson, D. D., D. B. Wilcox, and D. R. McConville. 1983. Physical and Biological Investigations of the Main Channel Border Habitat of Pool 5a on the Upper Mississippi River in 1980. 2 vols. U.S. Army Corps of Engineers, St. Paul District, St. Paul, Minnesota. 251 p.

Cobb, S.P. and A.D. Magoun. 1995. Physical and Hydrologic Characteristics of Aquatic Habitat Associated with Dike Systems in the Lower Mississippi River, River Mile 320 to 610. Lower Mississippi River Environmental Program, Report 5, Mississippi River Commission, Vicksburg, Mississippi.

Lowry, D. R., M.P. Taylor, R.L. Warden and F.H. Taylor. 1987. Fish and Benthic Communities at Eight Lower Mississippi River Flood-Plain Lakes. Lower Mississippi River Environmental Program, Report 6, Mississippi River Commission, Vicksburg, Mississippi.

Way, C.M., A.J. Burky, C.R. Bingham, and A.C. Miller. 1995. Substrate Roughness, Velocity Refuges, and Macroinvertebrate Abundance on Artificial Substrates in the Lower Mississippi River**.** Journal of the North American Benthological Society*,* Vol. 14, No. 4, pp. 510-518.

Minnesota Pollution Control Agency
520 Lafayette Road North | St. Paul, MN 55155-4194 | 651-296-6300 | 800-657-3864 | 651-282-5332 TTY | www.pca.state.mn.us

September 28, 2006

Mr. Daniel Wilcox
U.S. Army Corps of Engineers
CEMVP-PM-E
190 - 5th Street East, Suite 401
St. Paul, MN 55101

RE: Draft Integrated General Reevaluation Report and Environmental Impact Statement for Lock and Dam 3 Mississippi River Navigation Safety and Embankments

Dear Mr. Wilcox:

Thank you for the opportunity to comment on the draft Environmental Impact Statement (DEIS) for the proposed Lock and Dam 3 project (Project). The proposal consists extending guide walls, channel modifications, and strengthening embankments. The Project is approximately six miles upstream of Red Wing. The Minnesota Pollution Control Agency (MPCA) has reviewed the DEIS for this Project. The MPCA staff has the following questions, information, and comments for your consideration and response in preparing the final EIS on the Project.

Mussel Beds
Please expand on how mussel bed impacts will be avoided. Page 2 says that the construction area will be smaller than previously proposed. However, Section 4.1.7.8 does not indicate how far the construction footprint is from the beds or if other protective measures may be necessary. Even though the work may not be in the surveyed mussel beds below the dam, it is not clear if the mussel beds will be exposed to significant new periods of increased siltation, turbidity or persistent pollutants.

Sedimentation
We note that Section 7.2.1 says mechanical dredging would limit sediment resuspension. However, the document is unclear as to the magnitude and duration of the sediment disturbances resulting from reconstruction work and from longer term changes to the currents.

It would be helpful if the document gave an estimate of how many tons of sediment is expected to be discharged to Pool 4 (Lake Pepin) from the construction activities as well as the duration of increased concentration of sediment in the water column. It is not clear if the duration would be on the order of days, weeks, or months. Also, please discuss the potential cycle or recurrence of increased sediment concentrations; for example, if the project is to last for four years, will there be several periods of one to two months during which concentrations are high, or will an entire summer be high? Similarly, it would be helpful to see a time line that estimates the dredging periods and their durations. Research suggests that duration of increased sediment concentration (more so than intensity of concentration) is the variable that most influences fish survivability.

It was not clear if the reconstruction work would result in any permanent changes in scouring or water quality. What monitoring is proposed for sedimentation before, during, and after construction activities?

Fish, Wildlife, Ecological
We believe that it would be beneficial to include a fishway in this Project and encourage the U.S. Army Corps of Engineers to pursue funding options.

Regarding the mercury concentrations in the sediment samples, Section 7.2.1 gives the range of sampled values. It is not clear if the higher values or the average would be considered high relative to a reference value for the river. Can this be clarified to assist in understanding the potential risk from mercury in the sediment?

The discussion of drawdown effects appears to oversimplify the potential adverse affects of a drawdown. Controlled drawdowns can be beneficial for allowing re-germination of existing natural seedbeds of emergent aquatic and wetland vegetation and the potential for stabilization of loose flocculated sediments in the system. Current wetlands may not always have remained permanently wet in the historic river floodplain.

On Page 7-8, the DEIS states regarding nesting eagles: "work on the upper embankment would be not be scheduled around..." Because of this typographical error (be not be), the intent is not clear.

Water Quality
Please discuss the potential effects of "changing the flow pattern" of the Mississippi River via dredging upstream of the lock and dam. The document is unclear about potential effects to the Minnesota-side, such as water quality at the Vermillion-Cannon tailwaters area.

Barge Traffic
The recommended extension of the lock guide wall by 862 feet appears to effectively make the current bend in the river into a sharper turn. The addition of the end wall cell presents a new barrier to collide with right at the bend in the river. This change appears to increase the likelihood of a barge navigation mishap for vessels traveling downstream, even if it lowers the mishap risk at the lock itself further downstream.

Other
On page 7-6, the table and text are inconsistent in citing N9 and N6, respectively.

This comment letter addresses matters of interest to MPCA staff reviewing the DEIS and is submitted for consideration by the responsible governmental unit in preparing the final EIS. It does not constitute approval by the MPCA of any or all elements of the Project for the purpose of pending or future permit action(s) by the MPCA. We have attempted to identify and consult with interested program staff to identify the MPCA permits that may be required. Additional comments or requests for information may be submitted in the future to address specific issues related to the development of such permit(s).

Ultimately, it is the responsibility of the Project proposer to secure any required permits and to comply with any requisite permit conditions. If you have other questions concerning our review of this document, please contact me at (651) 296-6703.

Sincerely,

Barbara Jean Conti

Barbara Jean Conti
Project Manager
Environmental Review and Operations Section
Regional Division

BJC:mbo
cc: Justin Watkins, MPCA – Rochester

St. Paul District Responses to Minnesota Pollution Control Agency Comments (letter dated September 28, 2006)

Comment:
Mussel Beds - Please expand on how mussel bed impacts will be avoided. Page 2 says that the construction area will be smaller than previously proposed. However, Section 4.1.7.8 does not indicate how far the construction footprint is from the beds or if other protective measures may be necessary. Even though the work may not be in the surveyed mussel beds below the dam, it is not clear if the mussel beds will be exposed to significant new periods of increased siltation, turbidity or persistent pollutants.

Response:
The lower embankment construction proposed in 1999 would have directly disturbed a species-rich and abundant mussel bed along the lower embankment through excavation and placement of riprap. The landward extent of the mussel bed along the lower embankment was accurately surveyed with divers and GPS equipment in August 2004. The landward boundary of the mussel bed was used to design the currently proposed work along the lower embankment to completely avoid the mussel bed. All excavation and placement of material for the embankments construction will occur landward of the mussel bed. Riverbed and riverbank material will be mechanically excavated in the way of the Marsh Lake and Gantenbein Lake spillways and water control structures. ACM will be placed over the spillways, extending under water. The riverward toe of the ACM mat will be anchored with riprap. Riprap will be used to protect the riverbanks in the areas of the water control structures. Mussels in the tailwater will be exposed to temporary and intermittent increases in suspended solids during the mechanical excavation and construction work along the lower embankment. Native mussels are adapted to survive temporary increases in suspended solids but are not tolerant of direct physical disturbance or burial. The construction work along the lower embankment is expected to take 2 years, with in-water excavation and placement of materials taking about 1 year. No other protective measures are possible (e.g., silt curtain, etc.) in that area given the river currents, other than to keep the work limits out of the mussel bed and to do the excavation by mechanical (rather than hydraulic) equipment. Material excavated for the embankment construction will be removed for upland disposal and not placed back into the water. Given the low concentrations of contaminants observed in the bulk chemical analyses of riverbed sediment immediately upstream of Lock and Dam 3, we do not anticipate significant mobilization of persistent pollutants into the river during the lower embankments construction.

Comment:
Sedimentation - We note that Section 7.2.1 says mechanical dredging would limit sediment resuspension. However, the document is unclear as to the magnitude and duration of the sediment disturbances resulting from reconstruction work and from longer term changes to the currents. It would be helpful to give an estimate of how many tons of sediment is expected to be discharged to Pool 4 (Lake Pepin) from the construction activities as well as the duration of increased concentration of sediment in the water column. It is not clear if the duration would be on the order of days, weeks, or months. Also, please discuss the potential cycle or recurrence of increased sediment concentrations; for example, if the project is to last for four years, will there be several periods of one to two months during which concentrations are high, or will an entire summer be high? Similarly, it would be helpful to see a time line that estimates the dredging periods and their durations. Research suggests that duration of increased sediment concentration (more so than intensity of concentration) is the variable that most influences fish survivability. It was not clear if the reconstruction work would result in any permanent changes

in scouring or water quality. What monitoring is proposed for sedimentation before, during, and after construction activities?

Response:
Excavation in the main channel using mechanical dredging equipment would resuspend less material than would hydraulic dredging. We revised the final report and the 404(b) Clean Water Act Evaluation to provide more detail on the effects of the mechanical dredging suspended solids concentrations and sediment load to Lake Pepin.

Although we cannot predict exactly what equipment a contractor would use, we anticipate that the work would be done using a barge-mounted crane with a 10-cy clamshell bucket, and 120-cy capacity bottom-dump barges. Using this equipment, daily production would be about 3,000 cy per day, working 10 hours per day. It would take about 40 days to excavate and place the 118,000 cy of material from the main channel dredge cut. Dredging would be done during the winter months to avoid conflicts with navigation traffic, when river discharge is low and to do the dredging when ambient suspended solids concentrations are typically under 10 mg/L at Lock and Dam 3 (according to LTRMP data).

Past research suggests that the range of sediment suspension by mechanical dredges is between 0.5 and 3 percent of the production rate. Similarly, sediments are suspended during placement operations when sediments are entrained (or “stripped”) from the descending plume into the water column during material placement. The fraction of sediment suspended during placement operations depends on dredged material characteristics, scow size, water depth at placement, and ambient currents. Previous research suggests that between 0.5 and 2 percent of sediments from a split-hull scow placement are suspended during placement.

Of that material, the sand would settle out rapidly, the silt would settle out more slowly and the clay fraction (assuming it is not cohesively aggregated) would remain in suspension and pass downriver.

Our simple calculations indicate that the dredging operations would increase ambient suspended solids concentrations from 10 mg/L to 12.4 mg/l in the tailwater. This level of Total Suspended Solids concentrations is well within the range to which Mississippi River fishes and mussels are adapted and should not impose stress on fish or mussels in the Lock and Dam 3 tailwater.

Additional sediment load to Lake Pepin from sediment resuspended during the dredging would add approximately 799 tons of sediment to the annual load of 368,765 tons, or approximately 0.22 percent of the total load during the year that dredging occurs.

We propose to monitor bathymetry of the dredge cut before and after dredging to monitor the amount of material removed and subsequent change in configuration of the dredge cut following dredging. Because of the minimal, temporary and intermittent effects of mechanical dredging on suspended solids concentrations, we do not propose to monitor suspended solids during the dredging and material placement work.

This information, with more detail, has been added to the final GRR/EIS and the the Section 404(b) Clean Water Act Evaluation.

Comment:

Fish, Wildlife, and Ecological - We believe that it would be beneficial to include a fishway in this Project and encourage the U.S. Army Corps of Engineers to pursue funding options

Response:
We agree that a fishway at Lock and Dam 3 could be ecologically effective and that there could be cost savings by constructing a fishway concurrently with lower embankment construction; however, the St. Paul District does not presently have the authority or a funding source to construct a fishway at Lock and Dam 3.

Section 206 of the Water Resources Development Act of 1996 provides authority for the Corps of Engineers to undertake restoration projects in aquatic ecosystems such as rivers, lakes and wetlands. The Corps evaluates projects that benefit the environment through restoring, improving, or protecting aquatic habitat for plants, fish and wildlife. A project is accepted for construction after a detailed investigation shows it is technically feasible, environmentally acceptable, and provides cost effective environmental benefits. Each project must be complete within itself, not a part of a larger project. Costs for Section 206 projects are shared between the Federal Government and a non-Federal sponsor in accordance with the Water Resources Development Act of 1996. The maximum Federal expenditure per project is $5 million, which includes both planning and construction costs. Costs of lands, easements, and project operation and maintenance are non-Federal costs. Funding for this program has been limited nationally by congressional appropriations.

As indicated in the draft Lock and Dam 3 report, we may be able to incorporate a fishway into the Lock and Dam 3 project though the Navigation and Ecosystem Sustainability Program, if that program receives authorization and funding through Congress.

Comment:
Regarding the mercury concentrations in the sediment samples, Section 7.2.1 gives the range of sampled values. It is not clear if the higher values or the average would be considered high relative to a reference value for the river. Can this be clarified to assist in understanding the potential risk from mercury in the sediment?

Response:
The St. Paul District has been monitoring sediment physical properties and bulk chemical concentrations in Mississippi River dredge cut sediments since the 1970s. The most recent survey was in summer 2002, with 42 samples from 39 locations from Upper St. Anthony Falls to Pool 11 (Noren 2003). We have used Ontario Ministry of the Environment and Energy (OME) sediment quality guidelines (SQG) to characterize contaminant concentrations in Upper Mississippi River sediments. The OME has designated SQG's for the No Effect Level (NEL), Lowest Effect Level (LEL), and Severe Effect Level (SEL) for a number of parameters including mercury. The LEL for mercury is 0.2 mg/kg. All the dredge cut sediments analyzed in 2002 had mercury concentrations of 0.03 mg/kg or less. The non-dredge cut sediment sample from the middle of Lake Pepin had 0.15 mg/kg of mercury. The highest mercury concentration in samples from the proposed dredge cut upstream of Lock and Dam 3 (sample 2A, Table 7-3, page 7-13) was 0.028 mg/kg of mercury. We added this discussion to the GRR/EIS and to the 404(b) Clean Water Act Evaluation.

Comment:

The discussion of drawdown effects appears to oversimplify the potential adverse affects [sic] of a drawdown. Controlled drawdowns can be beneficial for allowing re-germination of existing natural seedbeds of emergent aquatic and wetland vegetation and the potential for stabilization of loose flocculated sediments in the system. Current wetlands may not always have remained permanently wet in the historic river floodplain.

Response:
We agree that controlled drawdowns of Mississippi River navigation pools can have beneficial effects for the river ecosystem. An uncontrolled and accidental drawdown of Pool 3, however, could have much more adverse effects than an intentional controlled drawdown. An accidental drawdown could occur rapidly, stranding fish and mussels. An accidental drawdown of Pool 3 as the result of an embankment failure could be as much as 6 feet at the dam, much deeper than an intentional drawdown for vegetation management. An accidental drawdown of Pool 3 could occur outside the growing season, when adverse effects on mussels, fish spawning, wintering fish, and denning furbearers could occur.

Comment:
On Page 7-8, the DEIS states regarding nesting eagles: "work on the upper embankment would be not be scheduled around.. ." Because of this typographical error (be not be), the intent is not clear.

Response:
That sentence has been revised to: Work on the upper embankment would be scheduled to avoid the March through May eagle nesting season if eagles are nesting there, and construction would not resume until the young are fledged.

Comment:
Water Quality - Please discuss the potential effects of "changing the flow pattern" of the Mississippi River via dredging upstream of the lock and dam. The document is unclear about potential effects to the Minnesota-side, such as water quality at the Vermillion-Cannon tailwaters area.

Response:
The channel modifications upstream of Lock and Dam 3 would not significantly change the distribution of flow through the four roller gates at Lock and Dam 3, nor would they have any effect on water quality in the Vermillion-Cannon tailwaters area. We will provide more detail on the effects of the mechanical dredging and material placement in the final report as described above.

Comment:
Barge Traffic - The recommended extension of the lock guide wall by 862 feet appears to effectively make the current bend in the river into a sharper turn. The addition of the end wall cell presents a new barrier to collide with right at the bend in the river. This change appears to increase the likelihood of a barge navigation mishap for vessels traveling downstream, even if it lowers the mishap risk at the lock itself further downstream.

Response:
We examined a large number of navigation safety improvement alternatives as described in the draft report and in the Hydraulics Appendix. We made use of a physical hydraulic model and 2-D and 3-D numerical hydraulic models, including a towboat and barges simulation to assess the potential effectiveness of the alternatives in reducing the outdraft problem, improving

navigability and navigation safety. We consulted with experienced towboat pilots about the navigation safety improvement alternatives and independent technical review engineers experienced in navigation structures. We are confident that the recommended plan will improve navigability and navigation safety at Lock and Dam 3. Other alternatives, like a guard wall, would have presented another structure in the river for potential collisions. The recommended plan would leave the lock approach open, would reduce the outdraft current, and would not impose additional safety problems for recreational boaters. It would provide a longer guide wall for towboat operators to use to land against and to align their vessels with the lock.

Comment:
Other - On page 7-6, the table and text are inconsistent in citing N9 and N6, respectively.

Response:
The table has been corrected to refer to navigation alternative N6.

Comment:
This comment letter addresses matters of interest to MPCA staff reviewing the DEIS and is submitted for consideration by the responsible governmental unit in preparing the final EIS. It does not constitute approval by the MPCA of any or all elements of the Project for the purpose of pending or future permit action(s) by the MPCA. We have attempted to identify and consult with interested program staff to identify the MPCA permits that may be required. Additional comments or requests for information may be submitted in the future to address specific issues related to the development of such permit(s). Ultimately, it is the responsibility of the Project proposer to secure any required permits and to comply with any requisite permit conditions.

Response:
We will apply for State water quality certification prior to contracting for construction.

Reference:
Noren, J. 2003. Upper Mississippi River 2002 Sediment Chemistry Survey of USACE Dredge Cuts. U.S. Army Corps of Engineers, St. Paul District. St. Paul, Minnesota.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

OCT 16 2006

REPLY TO THE ATTENTION OF:

B-19J

Terry J. Birkenstock, Chief
Environmental and Economic Analysis Branch
Department of the Army
St. Paul District, Corps of Engineers
Sibley Square at Mears Park
190 Fifth Street East, Suite 401
St. Paul Minnesota 55101-1638

Re: Draft Integrated General Reevaluation Report and Environmental Impact Statement for Lock and Dam 3 Mississippi River Navigation Safety and Embankments CEQ Number: 20060356

Dear Mr. Birkenstock:

I am writing to provide the U. S. Environmental Protection Agency's (EPA) comments on the Draft Integrated General Reevaluation Report and Environmental Impact Statement for Lock and Dam 3 (EIS) under the National Environmental Policy Act (NEPA), and Section 309 of the Clean Air Act. Lock and dam 3 is a navigation dam on the Upper Mississippi River 6 miles upriver from Red Wing, Minnesota in Pierce County Wisconsin, and Goodhue County, Minnesota. Two long-standing and related problems at lock and dam 3 involve navigation safety and the Wisconsin embankments. The location of this lock and dam is on a bend of river that is affected by current outdrafts. These outdrafts make approaching the locks difficult and have resulted in navigational accidents. Since 1963, 11 accidents have occurred when tows collided with the gated part of the dam. The Wisconsin embankments were constructed to maintain water levels in two floodplain lakes. These embankments were not constructed to modern engineering standards, and have deteriorated over the years, and are vulnerable to failure. The preferred plan that would address the navigation safety and embankment issues would consist of 1.) Extended guide wall and channel modifications, 2.) Strengthened Wisconsin embankments with phased construction.

Based on our review, we have rated the draft EIS as "EC-2." The "EC" indicates that we have environmental concerns. Our concerns center on the construction of the proposed project. The "2" indicates that additional information is required to support the analysis and findings stated in the document. The overall rating is based on our concerns with proposed mitigation for forested floodplains, water quality, and cumulative impact analysis. U.S. EPA's NEPA rating summary is enclosed. Our detailed comments follow.

In terms of mitigation for forested floodplains, the draft EIS provides a discussion of the measures that will be utilized to determine successful mitigation. That discussion identified that the mitigation sites would be monitored and seedlings replanted when there is a failure. However, this discussion did not provide any detailed information that would provide a better understanding of when and how the proposed mitigation plan will be implemented. For example, under what circumstances would additional plantings be done? What will the total time that the mitigation site will be monitored to ensure the stated goals are achieved? Answers to these types of questions would be useful. In addition, we also recommend that the Corps consider incorporating a percentage of tree saplings into the mitigation plan. The planting of 10 to 20 saplings per acre would promote diversity in the age class.

We disagree with the conclusion that there are no mitigation measures that can be used to offset the potential release of ammonia from the sediment into the water from the placement of dredge material on terrestrial land. We do agree that the timing of the dredging during the cooler months will greatly reduce the release of ammonia into the water column. Such design features as holding ponds, aeration, and/or return points that maximize the exposure of water to the air are all features that would reduce the ammonia effects. We recommend that you reconsider these methods for mitigating for the release of ammonia from upland dredge material placement.

In terms of cumulative impact analysis, the draft EIS needs to provide much more substantial discussion to support the stated conclusion that the construction activities of this project will not contribute adversely to the overall ecological health of the river. The draft EIS did not demonstrate how these types of impacts were examined and how the degree of the impacts to the various resources were determined. Instead, the draft EIS simply stated that activities would not result in cumulative impacts. Therefore, we have concerns regarding the lack of documentation of a complete cumulative impact analysis. We recommend that you provide appropriate documentation of the cumulative impact analysis that was conducted for the proposed project.

Thank you for the opportunity to review and comment on the draft EIS for the proposed embankment project. We are available to meet to discuss our concerns and comments. If you wish to meet or have any questions or comments, please contact Al Fenedick of my section. Al can be reached at 312 886-6872 or by E-mail at fenedick.al@epa.gov.

Sincerely,

Kenneth A. Westlake, Chief
NEPA Implementation Section

Enclosure

Response to U.S. Environmental Protection Agency Comments
(Letter dated October 16, 2006)

Comment:
Based on our review, we have rated the draft EIS as "EC-2." The "EC" indicates that we have environmental concerns. Our concerns center on the construction of the proposed project. The "2" indicates that additional information is required to support the analysis and findings stated in the document. The overall rating is based on our concerns with proposed mitigation for forested floodplains, water quality, and cumulative impact analysis. U.S. EPA's NEPA rating summary is enclosed. Our detailed comments follow.

In terms of mitigation for forested floodplains, the draft EIS provides a discussion of the measures that will be utilized to determine successful mitigation. That discussion identified that the mitigation sites would be monitored and seedlings replanted when there is a failure. However, this discussion did not provide any detailed information that would provide a better understanding of when and how the proposed mitigation plan will be implemented. For example, under what circumstances would additional plantings be done? What will the total time that the mitigation site will be monitored to ensure the stated goals are achieved? Answers to these types of questions would be useful. In addition, we also recommend that the Corps consider incorporating a percentage of tree saplings into the mitigation plan. The planting of 10 to 20 saplings per acre would promote diversity in the age class.

Response:
The restoration plan for the mitigation area(s) was prepared by foresters in the St. Paul District Natural Resources Management office in LaCrescent Minnesota. The methods for restoring floodplain forest described in the plan have proven effective in other nearby areas on the Upper Mississippi River. We modified the Mitigation Plan to include a restoration objective for tree composition as well as stand density. We extended the monitoring period, with replanting to be done if necessary to attain the restoration objectives for tree density (average of 108 trees >2 inches DBH at year 10) and composition (at least 10 percent hackberry and swamp white oak) at year 10. We extended the monitoring program and management to maintain those objectives over time, with replanting as needed. The plan calls for direct seeding of silver maple, cottonwood and black willow, and for planting seedlings and saplings of hackberry and swamp white oak. Inevitably on a forest restoration project, there will be fairly even age distribution of trees. However, 20 percent of the mitigation land, interspersed with the planted areas, will be allowed to revegetate naturally from local propagules. That should provide some additional successional diversity.

Comment:
We disagree with the conclusion that there are no mitigation measures that can be used to offset the potential release of ammonia from the sediment into the water from the placement of dredge material on terrestrial land. We do agree that the timing of the dredging during the cooler months will greatly reduce the release of ammonia into the water column. Such design features as holding ponds, aeration, and for return points that maximize the exposure of water to the air are all features that would reduce the ammonia effects. We recommend that you reconsider these methods for mitigating for the release of ammonia from upland dredge material placement.

Response:

Material excavated from the embankments construction would be mechanically removed and disposed at an upland site with no return water flow back to rivers.

Excavation for channel modifications would be done by mechanical dredging. Analysis of the main channel bed material showed that it has low percent fines and low ammonia concentration. In-water placement of that material should not result in toxic levels of unionized ammonia, due to the low sediment ammonia concentrations and cold-water time period when the dredging will occur.

Comment:
In terms of cumulative impact analysis, the draft EIS needs to provide much more substantial discussion to support the stated conclusion that the construction activities of this project will not contribute adversely to the overall ecological health of the river. The draft EIS did not demonstrate how these types of impacts were examined and how the degree of the impacts to the various resources were determined. Instead, the draft EIS simply stated that activities would not result in cumulative impacts. Therefore, we have concerns regarding the lack of documentation of a complete cumulative impact analysis. We recommend that you provide appropriate documentation of the cumulative impact analysis that was conducted for the proposed project.

Response:
We revised the EIS to include a more complete discussion of cumulative effects.

IN REPLY REFER TO:

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Custom House, Room 244
200 Chestnut Street
Philadelphia, Pennsylvania 19106-2904

October 11, 2006

ER 06/877

Colonel Michael F. Pfenning
District Engineer and Commander
St. Paul District, U.S. Army Corps of Engineers
190 Fifth Street East, Suite 401
St. Paul, Minnesota 55101

Attention: Mr. Daniel Wilcox, CEMVP-PM-E

Dear Colonel Pfenning:

The Department of the Interior (Department) has reviewed the August 2006 Draft Integrated Reevaluation Report and Environmental Impact Statement (DEIS) for the Lock and Dam 3 Mississippi River Navigation Safety and Embankments Plan to Reduce Related Navigation Safety and Embankment Problems, Upper Mississippi River; Goodhue County, Minnesota, and Pierce County, Wisconsin

The U.S. Fish and Wildlife Service (Service) has been involved in portions of this project for nearly 30 years. As indicated in the DEIS, the project has a long history of issues and concerns related to navigation safety and project operation, environmental impacts, reducing the risk of tow accidents, alternatives for improvements to the Wisconsin embankments, fish passage, project funding, and interagency coordination. During the past decade, federal and state agency personnel have met on many occasions to develop a mutually acceptable alternative for a combined navigation safety and embankments project at Lock and Dam 3. The most recent concept includes the use of adaptive management involving a phased approach to construction of the overall project, evaluation of the effects of initially constructed elements, and establishment of a decision process for future actions.

Navigation Safety Component

The recommended alternative N6E5 includes a navigation safety component involving construction of an 862-foot-long guidewall extension, channel deepening by dredging 118,000 cubic yards of sand upstream of the gates, and placement of sand and rock in the lock approach area to reduce the risk of tow accidents at Lock and Dam 3 during outdraft conditions. Outdraft conditions at Lock and Dam 3 occur when river discharge exceeds 21,000 cfs. As indicated in the DEIS and at many meetings over the years, the risk of tow accidents during outdraft conditions at Lock and Dam 3 will not be eliminated by the preferred alternative but should be reduced. We support the proposed navigation safety component at Lock and Dam 3 as a means to avoid future impacts to valuable fish and wildlife habitats that may be associated with tow accidents and spillage of cargo. We also recognize that the proposed safety improvements will not be constructed for several years. To reduce the risk of tow accidents during outdraft

conditions at Lock and Dam 3 until the safety improvements area is completed, the Service continues to recommend mandatory use of a helper boat. For many years, a private helper boat has been used by tows during outdraft conditions to avoid accidents. As stated in the DEIS, tow boat operators estimate that the helper boat prevents 90 percent of accidents that may otherwise occur at Lock and Dam 3. However, use of the private helper boat is presently voluntary, and according to the DEIS, only 53 percent of tow boat pilots use the helper boat during outdraft conditions. It would be logical to conclude that the risk of future accidents at Lock and Dam 3 would be reduced if all tows were required to use a helper boat during outdraft conditions until the proposed navigation safety project is constructed and monitored.

Pages 5-4 and 5-5 of the DEIS describe various legal and policy issues associated with mandatory use of a helper boat. Considering these factors and definitions, we recommend that existing outdraft conditions be deemed an "emergency" condition at Lock and Dam 3 by the Corps of Engineers (Corps) and that use of a helper boat be required of all downbound tows during outdraft conditions. We recommend this requirement be established at the beginning of the 2007 navigation season. Once the proposed project is constructed, the need for a helper boat at Lock and Dam 3 can be reconsidered after the new outdraft conditions and safety improvements are monitored and evaluated.

Wisconsin Embankments Component

Upper Spot Dikes: We support proposed improvements to the upstream spot dikes in Wisconsin as a means to maintain water-control capabilities in Pool 3. However, we would like to reiterate the Service's concerns that habitat impacts be minimized during construction, as well as during future operation and maintenance of the spot dikes and access trail. We concur with the position stated in the DEIS to minimize the height and width of the access trail to be used for the initial construction and later inspections and maintenance of the spot dikes.

Adaptive Management and Sequencing: The majority of habitat impacts associated with the Lock and Dam 3 Safety/Embankments Project would result from construction of the various embankment features in Wisconsin. Our support of the preferred alternative N6E5 is dependent on the concept of adaptive management and project phasing which will delay or avoid habitat losses in the Gantenbien/Marsh Lakes area.

Throughout the planning process, the Service has voiced its concerns over project-related impacts to fish and wildlife habitats associated with construction of the embankment features in Wisconsin. As indicated above and in the DEIS, private lands within the Gantenbien/Marsh Lake complex are some of the best remaining habitats on the river. As discussed at past meetings, these wetlands were the focus for court decisions of the past that led to the unique location and design of the present Lock and Dam 3 water-control system in order to minimize adverse impacts to habitat, as well as to recreational use. We strongly believe that this intent must be carried forward with the proposed project.

During the past few years, an adaptive management process has been proposed by the Minnesota and Wisconsin Departments of Natural Resources and the Service. The Adaptive Management process would avoid and minimize adverse habitat impacts by using a decision process to operate and maintain existing project features, upgrade or construct new features to prevent future erosion, and evaluate this work before proceeding to more expensive and complex features which have additional habitat impacts. We understand that the Wisconsin and Minnesota Departments of Natural Resources may provide more detailed comments and recommendations

on project phasing, adaptive management, and State permitting requirements. We anticipate their comments and permitting requirements may further divide Phase 1 into a sequence of smaller projects defined by an overall process of adaptive management. The Service supports the concept of adaptive management and is most willing to participate in these discussions on the Wisconsin embankments. In this regard, Page 6-14 of the DEIS briefly describes the decision-making process for initiating Phase 2 construction. This decision process must be more fully developed in cooperation with the interagency Planning Development Team. To facilitate this process, we recommend that the River Resources Forum be used for interagency coordination on Phase 2 construction issues and for developing a detailed decision process/matrix.

Water Management Plan for Gantenbien and Marsh Lakes: Gantenbien and Marsh Lakes have historically been managed by their private landowners for waterfowl management and recreational hunting. Water levels were manipulated by water-control structures at various locations. We recommend that a water-management plan be developed for Gantenbien and Marsh Lakes. The plan should include a bathymetric survey of the affected wetland basins to determine their existing drawdown potential and whether access-channel dredging or other measures are needed to facilitate future drawdowns. This information should then be used to determine the elevation of proposed sheet pile and/or control structures used to manage water levels after the proposed project is constructed. At this time and in the absence of bathymetric data, it appears that the elevation of sheetpile proposed in front of water control structures in alternative N6E5 limits the capability of future water-management options (or capability of existing water control structures) in Marsh and Gantenbien Lakes.

Environmental Mitigation Plan: In addition to measures taken to avoid and minimize project impacts, the Department supports the proposed compensatory mitigation plan as addressed in the DEIS. The mitigation plan involves restoration of 313 acres of floodplain forest in the vicinity of Pierce County, Wisconsin. Our preference would be that mitigation lands be obtained before project construction begins; wetland restoration activities could begin concurrently with construction activities.

Fish Passage: When the Nine-foot Channel Project was contemplated, the War Department/Department of Army recognized that fish passage may be a future issue with construction of the many locks and dams on the Upper Mississippi River System (UMRS). They concluded that fish passage facilities would be installed at navigation locks and dams if necessary in the future, thus providing a link between fish passage and the Corps under the authorized Nine-Foot Channel Project.

The subject of fish passage on the UMRS has been discussed at the River Resources Forum and other venues. It has become a major issue on the UMRS as evidenced by the formation of a separate Project Development Team (PDT) on fish passage under the Navigation and Ecosystem Sustainability Program (NESP). The fish-passage PDT is proposing fish passage facilities at several locks and dams over the next 15 years. Lock and Dam 3 was specifically eliminated as a potential fish-passage site under NESP because it was assumed that the project would be constructed in conjunction with the Lock and Dam 3 Safety/Embankments Project.

Participants in the Lock and Dam 3 Safety/Embankments Study had identified the maintenance or improvement of fish passage through Lock and Dam 3 as one of the objectives of the project. Previous project reports and alternatives proposed in the last decade by the Corps had included construction of a fish-passage facility as an integral feature of the Lock and Dam 3

Safety/Embankments Project. The DEIS indicates that construction of a fishway in conjunction with an embankments project could result in cost savings over constructing a fishway separately.

However, the DEIS indicates that a fish-passage facility was dropped from the plan due to funding issues associated with the Inland Waterways Trust Fund and lack of authority by the Corps to implement ecosystem restoration projects. In light of the need for a fishway to allow passage of native migratory fish through Lock and Dam 3 and the cost savings over constructing a fishway separately at some time in the future, **the Department strongly supports construction of a fishway at Lock and Dam 3 in conjunction with the proposed safety/navigation project**. We recommend that, if needed, the Corps seek authorization and additional funding to ensure that construction of a fish-passage facility is made an integral feature of the Lock and Dam 3 Safety/Embankments Project.

Specific Technical Comments

Page 3-25, Section 3.3.8, Future Without-Project Conditions – River Ecosystem: The DEIS states that "Asian carp(s) may prove to be very disruptive when they invade the upper river, …" In fact, whether or not the proposed Wisconsin embankment remediation is developed, more than one species of Asian carps (cyprinids) may invade the project area. As invasive non-native fish species, several introduced cyprinids have caused, or have the potential to cause, environmental or economic harm (Schofield, P. J. et al 2005)

If the authors of the DEIS are aware of such findings, the U.S. Geological Survey strongly recommends that a report be filed with our Nonindigenous Aquatic Species Database (http://nas.er.usgs.gov/SightingReport.asp). It is requested that any Asian carp specimens captured in the Upper Mississippi be retained as vouchers to verify identification and also for scientific purposes, mainly to determine reproductive status and provide information on diets. To aid in accurate identification, please consult Schofield, P. J. et al. (2005) on introduced cyprinids. The publication is now available on the web at http://fisc.er.usgs.gov/Carp_ID/index.html. A recent publication on the black carp (Nico et al. 2005) should help identify the species or, for consideration, be useful in the development of mitigation strategies for potential invading Asian carps in the upper Mississippi River.

The Department looks forward to working with the Corps in finalizing the planning for the project, and ensuring that project impacts to resources of concern to the Department are adequately addressed. For matters related to fish and wildlife resources and threatened and endangered species, please continue to coordinate with Mr. Tony Sullins, Field Supervisor, Twin Cities Field Office, U.S. Fish and Wildlife Service, 4101 East 80th Street, Bloomington, Minnesota 55425-1665, telephone (612) 725-3548, and/or Mr. Gary Wege, project biologist, at (612) 725-3548 extension 207. If you have questions concerning our comments on Asian carp, please contact Lloyd Woosley, Chief of the USGS Environmental Affairs Program, at (703) 648-5028 or at lwoosley@usgs.gov.

We appreciate the opportunity to review the document and provide comments.

Sincerely,

Michael T. Chezik

Michael T. Chezik

REFERENCES

Nico, L.G., J.D. Williams, and H.L. Jelk. 2005. Black carp: biological synopsis and risk assessment of an introduced fish. American Fisheries Society, Special Publication 32, Bethesda, Maryland, 337p.

Schofield, P. J., J. D. Williams, L. G. Nico, P. Fuller, and M.R. Thomas. 2005. Foreign Nonindigenous Carps and Minnows (Cyprinidae) in the United States - A Guide to their Identification, Distribution, and Biology. Scientific Investigations Report 2005-5041, http://fisc.er.usgs.gov/Carp_ID/index.html.

cc:
L. MacLean, FWS, Fort Snelling, MN
T. Sullins, FWS, Bloomington, MN
L. Woosley, GS, Reston, VA

Responses to Comments from the Department of the Interior
(letter dated October 11, 2006)

Comment:
The Department of the Interior (Department) has reviewed the August 2006 Draft Integrated Reevaluation Report and Environmental Impact Statement (DEIS) for the Lock and Dam 3 Mississippi River Navigation Safety and Embankments Plan to Reduce Related Navigation Safety and Embankment Problems, Upper Mississippi River; Goodhue County, Minnesota, and Pierce County, Wisconsin

The U.S. Fish and Wildlife Service (Service) has been involved in portions of this project for nearly 30 years. As indicated in the DEIS, the project has a long history of issues and concerns related to navigation safety and project operation, environmental impacts, reducing the risk of tow accidents, alternatives for improvements to the Wisconsin embankments, fish passage, project funding, and interagency coordination. During the past decade, federal and state agency personnel have met on many occasions to develop a mutually acceptable alternative for a combined navigation safety and embankments project at Lock and Dam 3. The most recent concept includes the use of adaptive management involving a phased approach to construction of the overall project, evaluation of the effects of initially constructed elements, and establishment of a decision process for future actions.

Navigation Safety Component
The recommended alternative N6E5 includes a navigation safety component involving construction of an 862-foot-long guidewall extension, channel deepening by dredging 118,000 cubic yards of sand upstream of the gates, and placement of sand and rock in the lock approach area to reduce the risk of tow accidents at Lock and Dam 3 during outdraft conditions. Outdraft conditions at Lock and Dam 3 occur when river discharge exceeds 21,000 cfs. As indicated in the DEIS and at many meetings over the years, the risk of tow accidents during outdraft conditions at Lock and Dam 3 will not be eliminated by the preferred alternative but should be reduced. We support the proposed navigation safety component at Lock and Dam 3 as a means to avoid future impacts to valuable fish and wildlife habitats that may be associated with tow accidents and spillage of cargo. We also recognize that the proposed safety improvements will not be constructed for several years. To reduce the risk of tow accidents during outdraft conditions at Lock and Dam 3 until the safety improvements area is completed, the Service continues to recommend mandatory use of a helper boat. For many years, a private helper boat has been used by tows during outdraft conditions to avoid accidents. As stated in the DEIS, tow boat operators estimate that the helper boat prevents 90 percent of accidents that may otherwise occur at Lock and Dam 3. However, use of the private helper boat is presently voluntary, and according to the DEIS, only 53 percent of tow boat pilots use the helper boat during outdraft conditions. It would be logical to conclude that the risk of future accidents at Lock and Dam 3 would be reduced if all tows were required to use a helper boat during outdraft conditions until the proposed navigation safety project is constructed and monitored.

Pages 5-4 and 5-5 of the DEIS describe various legal and policy issues associated with mandatory use of a helper boat. Considering these factors and definitions, we recommend that existing outdraft conditions be deemed an “emergency” condition at Lock and Dam 3 by the Corps of Engineers (Corps) and that use of a helper boat be required of all downbound tows during outdraft conditions. We recommend this requirement be established at the beginning of the 2007 navigation season. Once the proposed project is constructed, the need for a helper boat at Lock and Dam 3 can be reconsidered after the new outdraft conditions and safety improvements are monitored and evaluated.

Response:
The navigation safety problem at Lock and Dam 3 is a chronic problem, not an emergency. We agree, however, that it would be prudent to pursue increased use of a helper boat by down bound tows during outdraft conditions as an interim measure. We modified the report to retain the "Require Helper Boat Use" alternative as an interim measure and included this statement:

> As an interim measure until navigation safety improvements are constructed, the St. Paul District will pursue complete voluntary compliance by the towing industry for helper boat use during outdraft conditions (river discharge greater than 21,000 cfs) for down bound tows approaching Lock and Dam 3 with six or more loaded barges.

Wisconsin Embankments Component
Upper Spot Dikes: We support proposed improvements to the upstream spot dikes in Wisconsin as a means to maintain water-control capabilities in Pool 3. However, we would like to reiterate the Service's concerns that habitat impacts be minimized during construction, as well as during future operation and maintenance of the spot dikes and access trail. We concur with the position stated in the DEIS to minimize the height and width of the access trail to be used for the initial construction and later inspections and maintenance of the spot dikes.

Adaptive Management and Sequencing: The majority of habitat impacts associated with the Lock and Dam 3 Safety/Embankments Project would result from construction of the various embankment features in Wisconsin. Our support of the preferred alternative N6E5 is dependent on the concept of adaptive management and project phasing which will delay or avoid habitat losses in the Gantenbien/Marsh Lakes area.

Throughout the planning process, the Service has voiced its concerns over project-related impacts to fish and wildlife habitats associated with construction of the embankment features in Wisconsin. As indicated above and in the DEIS, private lands within the Gantenbien/Marsh Lake complex are some of the best remaining habitats on the river. As discussed at past meetings, these wetlands were the focus for court decisions of the past that led to the unique location and design of the present Lock and Dam 3 water-control system in order to minimize adverse impacts to habitat, as well as to recreational use. We strongly believe that this intent must be carried forward with the proposed project.

Response:
We agree that the Gantenbein Lakes area has high quality habitat and have described it in the EIS. We have not researched the history of planning for the construction of Lock and Dam 3. We have not seen records of any litigation that may have led to the location and design of Lock and Dam 3.

Comment:
During the past few years, an adaptive management process has been proposed by the Minnesota and Wisconsin Departments of Natural Resources and the Service. The Adaptive Management process would avoid and minimize adverse habitat impacts by using a decision process to operate and maintain existing project features, upgrade or construct new features to prevent future erosion, and evaluate this work before proceeding to more expensive and complex features which have additional habitat impacts. We understand that the Wisconsin and Minnesota Departments of Natural Resources may provide more detailed comments and recommendations on project phasing, adaptive management, and State permitting requirements. We anticipate their comments and permitting requirements may further divide

Phase 1 into a sequence of smaller projects defined by an overall process of adaptive management. The Service supports the concept of adaptive management and is most willing to participate in these discussions on the Wisconsin embankments. In this regard, Page 6-14 of the DEIS briefly describes the decision-making process for initiating Phase 2 construction. This decision process must be more fully developed in cooperation with the interagency Planning Development Team. To facilitate this process, we recommend that the River Resources Forum be used for interagency coordination on Phase 2 construction issues and for developing a detailed decision process/matrix.

Response:
The extended guide wall, channel modifications and the strengthened the spot dikes would lessen the likelihood of a navigation accident and embankment failure that would jeopardize control of Pool 3. Unfortunately, the risk of a gate blockage event (e.g., barges in the dam gates as a result of a navigation accident or a woody debris jam) remains. The Prairie Island and Allen S. King power plants may be affected by an accidental drawdown of Pool 3. We assessed project alternatives and residual risks in the risk assessment study and found that the most vulnerable portions of the lower embankment must be protected against a gate blockage event, which would cause high head and high velocity conditions along the lower embankment. Riprap is not sufficient to withstand the high velocities associated with a gate blockage event; ACM is proposed. As stated in the report, the Corps agrees that portions of the lower embankment are sufficiently strong at this time and can be left for a second stage of construction that would occur only after additional erosion of those portions of the lower embankment, but some risk is associated with leaving those portions of the embankment until a later time. The proposed work along the spot dike alignment is partly in response to the risk associated with not improving portions of the lower embankment (the spot dike work is also partly in response to degradation that has occurred along the spot dike alignment).

We will construct all features of the Phase 1 embankments construction as described in Alterative E5 in the draft GRR/EIS. All features are needed in combination to have an embankment system that can resist the forces of overtopping, seepage, concentration of flow by woody debris, wave action and river currents. Construction scheduling will be contingent on available funding. We will work closely with the MnDNR, WDNR, USFWS, and landowners on the construction schedule in development of the design documentation report and plans and specifications.

The Phase 1 embankments would be inspected regularly and after overtopping events. If breaches through the unprotected areas were to occur, additional segments of the lower embankment would be built as needed. An interagency team with hydraulic engineers, geotechnical engineers, and dam safety engineers from the St. Paul District and the WDNR would inspect the unprotected areas to determine the best course of action (interim repairs, partial or complete Phase 2 project construction). Because there are so many causal factors for breaches in the unprotected areas of the Wisconsin embankments, setting quantitative criteria for decision-making is not feasible. We would rely on the judgment of technical experts to identify needed parts of the Phase 2 construction. We would coordinate this with the River Resources Forum as we do for other navigation project activities.

Comment:
Water Management Plan for Gantenbien and Marsh Lakes: Gantenbien and Marsh Lakes have historically been managed by their private landowners for waterfowl management and recreational hunting. Water levels were manipulated by water-control structures at various

locations. We recommend that a water-management plan be developed for Gantenbien and Marsh Lakes. The plan should include a bathymetric survey of the affected wetland basins to determine their existing drawdown potential and whether access-channel dredging or other measures are needed to facilitate future drawdowns. This information should then be used to determine the elevation of proposed sheet pile and/or control structures used to manage water levels after the proposed project is constructed. At this time and in the absence of bathymetric data, it appears that the elevation of sheetpile proposed in front of water control structures in alternative N6E5 limits the capability of future water-management options (or capability of existing water control structures) in Marsh and Gantenbien Lakes.

Response:
We included replacement of the existing water control structures in the plan to enable maintenance of water levels in the Gantenbein Lakes to ensure structural integrity of the embankments system and to allow maintaining the existing hydrologic regime in those lakes. Approach channels to the water control structures would be excavated a short distance into the lakes, but level ditching throughout the lakes to enable complete drawdowns would not be done. New Marsh Lake and Gantenbein Lake outlet water control structures would be constructed. Sheet pile weirs would be set on the inlet side of the new water control structures to maintain minimum water levels needed to ensure structural integrity of the embankments. Above those elevations, the landowners would be able to regulate lake levels for habitat management purposes. We would not prescribe their operating plan, but we and the WDNR will consult with the landowners on that subject.

The existing Marsh Lake outlet water control structure that is still functional has an invert elevation of approximately 669.0 feet. The approach channel to the structure has filled with sediment, and the landowners have only been able to regulate Marsh Lake water levels between elevation 674.0 feet and 675.2 feet for many years. We will modify the design to set the upstream weir on the Marsh Lake outlet structure at elevation 673.0 feet and excavate the jnlet channel into Marsh Lake.

We will modify the design for the Gantenbein Lake water control structure to have an upstream sheet pile weir set at 671.0 feet. The current lowest outlet elevation for Gantenbein Lake is approximately 673.7 feet. The source of this information is explained in section 17.b of the RER/EIS hydraulic appendix. The outlet structure for Gantenbein Lake would have a weir elevation of 673.0 feet, which is lower than the existing outlet elevation and would, therefore, provide greater water level management capability than the existing condition for Gantenbein Lake.

We will further discuss design of the outlet structures with the landowners, WDNR, MnDNR, and USFWS during prepartion of the design document report.

Comment:
Environmental Mitigation Plan: In addition to measures taken to avoid and minimize project impacts, the Department supports the proposed compensatory mitigation plan as addressed in the DEIS. The mitigation plan involves restoration of 313 acres of floodplain forest in the vicinity of Pierce County, Wisconsin. Our preference would be that mitigation lands be obtained before project construction begins; wetland restoration activities could begin concurrently with construction activities.

Response:

We are required and intend to do the real estate acquisition and implement floodplain forest restoration for mitigation before or concurrently with construction. We do not have the authority or the funding to do any real estate work prior to having an approved report and funding for construction.

Comment:
Fish Passage: When the Nine-foot Channel Project was contemplated, the War Department/Department of Army recognized that fish passage may be a future issue with construction of the many locks and dams on the Upper Mississippi River System (UMRS). They concluded that fish passage facilities would be installed at navigation locks and dams if necessary in the future, thus providing a link between fish passage and the Corps under the authorized Nine-Foot Channel Project.

The subject of fish passage on the UMRS has been discussed at the River Resources Forum and other venues. It has become a major issue on the UMRS as evidenced by the formation of a separate Project Development Team (PDT) on fish passage under the Navigation and Ecosystem Sustainability Program (NESP). The fish-passage PDT is proposing fish passage facilities at several locks and dams over the next 15 years. Lock and Dam 3 was specifically eliminated as a potential fish-passage site under NESP because it was assumed that the project would be constructed in conjunction with the Lock and Dam 3 Safety/Embankments Project.

Participants in the Lock and Dam 3 Safety/Embankments Study had identified the maintenance or improvement of fish passage through Lock and Dam 3 as one of the objectives of the project. Previous project reports and alternatives proposed in the last decade by the Corps had included construction of a fish-passage facility as an integral feature of the Lock and Dam 3 Safety/Embankments Project. The DEIS indicates that construction of a fishway in conjunction with an embankments project could result in cost savings over constructing a fishway separately. However, the DEIS indicates that a fish-passage facility was dropped from the plan due to funding issues associated with the Inland Waterways Trust Fund and lack of authority by the Corps to implement ecosystem restoration projects. In light of the need for a fishway to allow passage of native migratory fish through Lock and Dam 3 and the cost savings over constructing a fishway separately at some time in the future, the Department strongly supports construction of a fishway at Lock and Dam 3 in conjunction with the proposed safety/navigation project. We recommend that, if needed, the Corps seek authorization and additional funding to ensure that construction of a fish-passage facility is made an integral feature of the Lock and Dam 3 Safety/Embankments Project.

Response:
We agree that a fishway at Lock and Dam 3 could be ecologically effective and that cost savings could be achieved by constructing a fishway concurrently with lower embankment construction; however, the St. Paul District does not presently have the authority or a funding source to construct a fishway at Lock and Dam 3.

Section 206 of the Water Resources Development Act of 1996 provides authority for the Corps of Engineers to undertake restoration projects in aquatic ecosystems such as rivers, lakes and wetlands. The Corps evaluates projects that benefit the environment through restoring, improving, or protecting aquatic habitat for plants, fish and wildlife. A project is accepted for construction after a detailed investigation shows it is technically feasible, environmentally acceptable, and provides cost effective environmental benefits. Each project must be complete within itself, not a part of a larger project. Costs for Section 206 projects are shared between

the Federal Government and a non-Federal sponsor in accordance with the Water Resources Development Act of 1996. The maximum Federal expenditure per project is $5 million, which includes both planning and construction costs. Costs of lands, easements, and project operation and maintenance are non-Federal costs. Funding for this program has been limited nationally by Congressional appropriations.

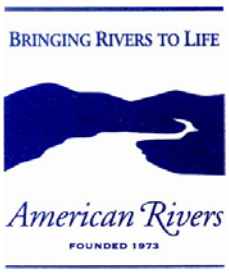
As indicated in the draft Lock and Dam 3 report, ite may be possible to incorporate a fishway into the Lock and Dam 3 project though the Navigation and Ecosystem Sustainability Program, if that program receives authorization and funding through Congress.

Lock and Dam 3 was not eliminated from the initial set of NESP fish passage projects because of the potential embankments work. State concerns about invasion of Asian carp influenced the selection of the initial sites for planning, engineering and design of fish passage improvements under NESP. Lock and Dam 3 rated highly as a site for a fishway among UMRS dams in the Navigation Study fish passage report.

Specific Technical Comments
Page 3-25, Section 3.3.8, Future Without-Project Conditions – River Ecosystem: The DEIS states that "Asian carp(s) may prove to be very disruptive when they invade the upper river, …" In fact, whether or not the proposed Wisconsin embankment remediation is developed, more than one species of Asian carps (cyprinids) may invade the project area. As invasive non-native fish species, several introduced cyprinids have caused, or have the potential to cause, environmental or economic harm (Schofield, P. J. et al 2005)

If the authors of the DEIS are aware of such findings, the U.S. Geological Survey strongly recommends that a report be filed with our Nonindigenous Aquatic Species Database (http://nas.er.usgs.gov/SightingReport.asp). It is requested that any Asian carp specimens captured in the Upper Mississippi be retained as vouchers to verify identification and also for scientific purposes, mainly to determine reproductive status and provide information on diets. To aid in accurate identification, please consult Schofield, P. J. et al. (2005) on introduced cyprinids. The publication is now available on the web at http://fisc.er.usgs.gov/Carp_ID/index.html. A recent publication on the black carp (Nico et al. 2005) should help identify the species or, for consideration, be useful in the development of mitigation strategies for potential invading Asian carps in the upper Mississippi River.

Response:
We are aware of the potential adverse effects of Asian carp on aquatic ecosystems in the Upper Mississippi River basin and have participated in discussions about strategies for delaying their invasion. Although we do not conduct fish sampling, we will be sure to inform the USGS of Asian carp found in the Upper Mississippi River.



October 13, 2006

Via email daniel.b.wilcox@mvp02.usace.army.mil

Mr. Daniel Wilcox
CEMVP-PM-E
St. Paul District, U.S. Army Corps of Engineers
190 Fifth Street East, Suite 401
St. Paul, MN 55101

Re: Comments on the Draft General Reevaluation Report and Environmental Impact Statement for Lock and Dam 3

Dear Mr. Wilcox:

American Rivers appreciates the opportunity to comment on the Draft General Reevaluation Report and Environmental Impact Statement for Lock and Dam 3, and is submitting the following comments for your consideration. By email dated October 4, 2006, we received an extension to submit comments by Friday, October 13, 2006.

American Rivers is a national conservation organization dedicated to protecting and restoring the nation's rivers and wetlands. American Rivers has more than 40,000 members across the country, including in the states of Minnesota and Wisconsin, and works in partnership with thousands of river and conservation organizations. American Rivers has a long history of working to ensure that Army Corps of Engineers (Corps) civil works projects reflect the highest scientific, economic, and environmental standards. We have extensive experience on Mississippi River issues, and actively participate in improving projects and promoting restoration that affect the Mississippi River.

The Draft General Reevaluation Report and Environmental Impact Statement understates impacts to significant aquatic resources. American Rivers urges the Corps to re-evaluate its impacts assessments. All project impacts should receive appropriate analysis in the final document in order to fulfill the Corps' legal mandate and stated commitment to protect the river environment, and to properly mitigate for any unavoidable impacts caused by project construction, operation, and maintenance. American Rivers also urges the Corps to strengthen its mitigation plan, and ensure that all mitigation for the project is implemented prior to project construction, as required by law.

A. The final EIS must fully account for all project impacts

We believe that the EIS does not fully account for the impacts described below, and urge the Corps to conduct the necessary analyses to accurately assess those impacts:

1) Sections 7.2.6 and 7.2.8 of the main report state that impacts from spillway construction will have minimal impacts to aquatic life and recreational fishing. However, these conclusions contradict existing scientific literature and empirical knowledge about fish habitat uses in the Upper Mississippi River System. Constructing spillways using articulated concrete mat (ACM) will reduce habitat diversity and diminish fishing opportunities. Additionally, creating the 100-foot wide berm for the spillway will require excavating the existing shoreline and will result in dramatic losses of marsh and riparian forest between the river and Marsh Lake. Last, the GRR and EIS must address the loss of 400 feet of natural and riprap shoreline and upstream and downstream overflow sloughs, the effect on the underwater portion of the ACM stream bank, and the loss of a 2,500-foot littoral area comprised of coarse substrates, woody debris, and irregular contours.

2) The Corps has not properly assessed the impacts of the closure dike that ties the guide wall extension to the riverbank shoreline. This component of the project will result in substantial losses of aquatic habitat, which will require mitigation.

3) The location of the staging area and avoidance and minimization measures for construction of upstream spot dikes is not referenced in the draft document.

4) On page 5 of Appendix J, the mitigation plan asserts that “[b]ecause no unavoidable losses of significant resources would result [from navigation improvements], and because the habitat changes associated with the channel modifications would increase production of benthic macroinvertibrates in the area, no compensatory mitigation is proposed for the navigation safety improvement portion of the project." American Rivers strongly disagrees with the assumption that proposed measures for navigation safety improvements will not have any unavoidable losses of significant resources. Central features of the navigation safety measures include dredging to deepen 30 acres of the main channel, filling 17 acres of the lock approach, and filling 1.5 acres of the Minnesota riverbank for a berm. By removing the bottom of rivers, lakes, and other bodies of water that serves as habitat for bottom-dwelling organisms, dredging clearly causes environmental harm. Dredging can also remove or damage aquatic biota, and disrupt sedimentary structures. Furthermore, dredging can re-suspend sediment into water, leading to a number of other consequences, particularly if the dredged sediment is contaminated with toxic substances. The disposal of the dredged material also causes its own set of significant environmental harm.

The EIS and GRR provide no scientific support for the claim that ACM serves as an adequate substitute for natural habitat for benthic macroinvertebrates. The Corps should provide scientific support for this claim. If sufficient scientific support to justify this conclusion does not exist, the Corps must identify the amount of damage caused by these features and propose mitigation to address those damages.

5) On page 5 of Appendix J, the mitigation plan states that the potential placement of excavated material on the meander scrolls in Marsh Lake would contribute to floodplain reforestation, and therefore would not require mitigation. We are unaware of any scientific evidence that could support this claim, and similar attempts at other projects have not yielded satisfactory results.

6) According to table 1 (Appendix J at 5), the E5 plan would impact a total of 87.36 acres of habitat, 65.7 acres of which are forested floodplain. The mitigation plan later states that over 20 acres of habitat will not be mitigated for, “[g]iven the limited effect on other habitat types within

the project area and the limited opportunities to provide functional mitigation features for channel border aquatic habitat in a cost effective manner." Appendix J at 8.

The decision not to mitigate for these impacts is unacceptable for three reasons. First, the determination that 20 acres of affected habitat constitutes "limited" impacts is arbitrary and not scientifically sound. Second, underestimating mitigation needs for planning efficiency is contrary to the Corps' stated goal of mitigating for all impacts cause by project construction, operation, and maintenance. Third, mitigation is not to be based on cost-efficiency determinations. Mitigation is required whenever a project will produce more than negligible impacts. 33 U.S.C. § 2283(d). Cost-efficiency is not a factor in that assessment. Moreover, "the benefits attributable to measures included in a project for the purpose of environmental quality, including improvement of the environment and fish and wildlife enhancement, shall be deemed to be at least equal to the costs of such measures." 33 U.S.C. § 2284.

Wetlands and instream habitat provide a host of ecosystem services, including floodwater storage, clean water, and habitat for the majority of species. In order to preserve these vital functions for the benefit of local communities, fish, and wildlife, mitigation plans must fully account for <u>all</u> impacts from project construction, operation, and maintenance.

B. Mitigation Must Be Carried Out Prior To Project Construction

The law is clear that mitigation for civil works projects must be carried out prior to or concurrently with project construction:

> "Steps to be taken prior to or concurrently with construction.
>
> (1) In the case of any water resources project which is authorized to be constructed by the Secretary before, on, or after the date of enactment of this Act [enacted Nov. 17, 1986], construction of which has not commenced as of the date of enactment of this Act [enacted Nov. 17, 1986], and which necessitates the mitigation of fish and wildlife losses, including the acquisition of lands or interests in lands to mitigate losses to fish and wildlife, as a result of such project, such mitigation, including acquisition of the lands or interests--
>
> > (A) shall be undertaken or acquired before any construction of the project (other than such acquisition) commences, or
> >
> > (B) shall be undertaken or acquired concurrently with lands and interests in lands for project purposes (other than mitigation of fish and wildlife losses),
>
> whichever the Secretary determines is appropriate, except that any physical construction required for the purposes of mitigation may be undertaken concurrently with the physical construction of such project."

33 U.S.C. § 2283 (a). Because lands and interests in lands needed for the project must be acquired before project construction can begin (approximately 395 acres of land exclusive of the mitigation lands must be purchased for the project), mitigation lands for the project also must be purchased before project construction begins. The mitigation plan also must be implemented before construction begins.

The Corps should clearly state that it will implement mitigation for this project before construction begins in any final Record of Decision for the project. The Corps should also ensure that specific mitigation lands and any actions needed to acquire those lands are identified in its mitigation plan for the project.

C. The Proposed Mitigation Plan Must Be Strengthened

As currently written, the proposed mitigation plan calls for restoring 313 acres of former floodplain forest that had been converted to agricultural land to mitigate for unavoidable impacts to significant resources caused by strengthening the Wisconsin embankments. Appendix J at 12-13. The Corps acknowledges that no mitigation is included for impacts to habitat types other than bottomland hardwood forest that lie within the construction disturbance footprint. Appendix J at 8. Mitigation must be undertaken to account for all project impacts, and we urge the Corps to ensure that all impacts are accurately identified (see discussion above).

As importantly, we urge the Corps to revise its mitigation plan to include the five items discussed in detail below. These changes are needed to improve the likelihood of mitigation success in light of the difficulties associated with successfully mitigating damages to wetlands and other aquatic habitats.

An extensive body of scientific literature demonstrates that wetlands mitigation is extremely difficult, and often fails. For example, one 1996 study published in *Ecological Applications* concludes that "[b]ased on over a decade of survey results, the cumulative record of past mitigation projects remains undeniably poor overall, with disappointingly few examples of success."[1] The "sober reality [is] that under present mitigation policies and practices 'losses are likely to be uncompensated for and that what we call mitigation has a high chance of failure.'"[2]

Mitigation for bottomland hardwood forests is no exception. The National Research Council reports that:

> Attempts to restore forested wetlands of the Southeast (e.g., bottomland hardwoods and cypress swamps) have encountered difficulties related to the time required to replace mature trees, the lack of material to transplant, the lack of knowledge of how and when to carry out seeding or transplantation, (Clewell and Lea, 1989) and altered hydrology (drainage for conversion to agriculture) of the wetland area.[3]

Because lost wetland functions are so difficult to re-establish, it is essential that the mitigation plan include each of the following key elements that will maximize the chance of successfully replacing lost the habitat values and functions as a result of the project.

(1) The Plan Must Fully Describe The Types And Amount Of Restoration Activities To Be Conducted And The Resource Functions And Values That Will Result From Those Activities

[1] Margaret S. Race and Mark S. Fonesca, *Fixing Compensatory Mitigation: What Will It Take*, Ecological Applications (1996) pp. 94-101 at 97.
[2] *Id*.
[3] National Research Council, *Restoration of Aquatic Ecosystems*, (National Academy Press 1992) at 311.

The plan should fully describe the amount and type of restoration activities that will be carried out. For example, while the plan mentions the need to restore the hydrologic regime of the mitigation site, the plan provides virtually no details on how this will happen or what resource values will be addressed by the hydrologic modifications.[4] Of the 13 plan details provided, 10 address only reforestation efforts (these include directions for the types of seedlings to be used, herbicide applications, tree density, and monitoring for tree survival). Even these details, however, provide little, if any, assurance that the plan will produce a mature and fully functioning bottomland hardwood wetland in 50 years.

The mitigation plan should identify lands that are available for carrying out the mitigation, and outline a plan that specifically addresses the necessary steps to restore the hydrologic functions of those lands. Hydrological modification is a critical component of successful wetlands restoration efforts. The plan also needs to identify any steps that will be needed to ensure that the restored site will achieve the appropriate level of species diversity. As the National Research Council has concluded, correct hydrology and species diversity are critical elements in restoring wetlands:

> Natural forested wetlands may support hundreds of plant species, many of which thrive in the understory (91 percent of 409 species in one riverine forest were understory species). Old-growth forests are dominated by trees that gradually achieve a dominant role in the canopy and that are self-sustaining through their ability to reproduce in their own shade. It is not clear that such climax species can be successfully established in open sites, or whether their introduction must await development of seral (intermediate successional stage) plant communities. . . . In many cases, restoration of suitable hydrologic conditions will be necessary.[5]

Appendix J states that the "floodplain forest in the affected area has mature native trees, including silver maple, green ash, black willow, and cottonwood. Some swamp white and red oaks are on the highest floodplain ground." Appendix J at 6. While the plan calls for planting some of each of these species, there is no final ecological goal for species diversity, and no plan elements that will assure the appropriate diversity. Moreover, there will be no way to tell if the appropriate diversity is being (or has been) achieved since the mitigation will be monitored for only 5 years. What happens, for example, if the seedlings are wiped out in year 6?

Appendix J also states that the "floodplain forest in the project area produces considerable leaf litter and woody debris, which contributes particulate organic matter to the aquatic ecosystem." Appendix J at 6. This woody debris provides important habitat as do the larger trees in the project area. It is not at all clear, however, how the proposed plan will result in the replacement of these lost functions. And there clearly is no way to tell if these functions will be replaced with only a 5 year monitoring plan.

In addition to addressing these issues, the plan should describe the wetland habitat and functional values that will be replaced through the mitigation, and the actions needed to achieve replacement of those lost functions and values. For example, the plan should describe how it will replace the short-term water storage, long-term water storage, water velocity reduction,

---

[4] We recognize that without having identified mitigation sites, developing a plan for restoring the hydrological regime is impossible. This is another reason why mitigation lands must be identified – and purchased – before project construction.

[5] *Restoration of Aquatic Ecosystems* at 311.

sediment detention, onsite erosion control, nutrient and dissolved substance removal, and organic carbon export values of the destroyed wetlands.

> Without having more details – including details on steps that will be needed to reestablish the necessary hydrologic regime – there is no way to determine whether the necessary steps will be taken to ensure successful mitigation. There is also no way to determine the likelihood of success of the proposed mitigation efforts.

(2) The Plan Must Establish Specific Ecological Success Criteria Beyond Tree Density Against Which Mitigation Success Will Be Measured

Scientists have long known that when monitoring to assess the success of mitigation is based on a relatively simple set of criteria, those criteria may or may not accurately reflect wetland function.[6] The proposed plan does not even propose a simple set of criteria for evaluating success. Instead it proposes only a single criterion – attaining a target average of 108 trees per acre over planted area 10 years after the initial planting. Moreover, there will be no way to determine whether even this goal has been achieved since mitigation monitoring will last for only 5 years. Appendix J at 19.

This single criterion is completely inadequate as an indicator of whether the mitigation plan has successfully mitigated a mature bottomland hardwood wetland forest. To mitigate for lost wetlands, the Corps must create, restore, or enhance wetland acres, functions and values. Attainment of a certain tree density does nothing to ensure replacement of lost wetland functions and values, which include short-term water storage, long-term water storage, water velocity reduction, sediment detention, onsite erosion control, nutrient and dissolved substance removal, and organic carbon export. The mitigation plan should include specific ecological success criteria in addition to tree density that will be measured to determine whether the lost functions and values of the destroyed wetlands are being replaced.

While the "mitigation area objectives" in Appendix J could provide some additional success criteria, these objectives are not included in the actual mitigation plan. *Compare* Appendix J "mitigation area objectives" at pages page 12-13 to Appendix J "restoration plan for the mitigation site(s)" at pages 18-19. And even if the "mitigation area objectives" were included as specific plan elements, they would not ensure replacement of the lost wetland functions and values discussed above.

Other criteria that could be used to determine ecological success include, but should not be limited to: species diversity, such as the diversity of bird communities; the establishment of undergrowth vegetation; indicators of plant health; and water quality measurements, including pH, alkalinity, dissolved oxygen, nitrogen, phosphorus, turbidity, suspended solids, the presence of heavy metals, and salinity, among others.[7]

(3) The Plan Must Require Monitoring Until Mitigation Success Is Established And Must Clearly Identify The Entity Responsible For Monitoring

---

[6] William J. Mitsch and Renee F. Wilson, *Improving the Success of Wetland Creation and Restoration With Know-How, Time, and Self-Design*, Ecological Applications (1996) pp. 77-83 at 77.

[7] See Mississippi State University's Department of Wildlife and Fisheries Research webpage at http://www.cfr.msstate.edu/fwrc/wildlife/bird.htm. U.S. Geological Survey, *A Guide to Bottomland Hardwood Reforestation*, Information and Technology Report USGS/BRD-2001-0011 (Revised 2004) at 67-69 at 67, 78-85.

The Corps is legally obligated to implement all the mitigation committed to in a Record of Decision. E.g., 40 C.F.R. § 1505.3; 33 C.F.R § 230.15. To help ensure such implementation, both the Council on Environmental Quality and Corps regulations require the Corps to monitor its mitigation requirements to ensure that they are properly carried out. 40 C.F.R. §§ 1505.2, 1505.3; 33 C.F.R. §230.15. Indeed, the Corps' regulations define monitoring as "that level of oversight activity necessary to ensure that the decision, including required mitigation measures, is implemented." 33 C.F.R. § 230.15.

The Corps has recognized that mitigation monitoring will typically require more than five years, particularly for mitigation that takes longer to develop and reach a level of stability. Regulatory Guidance Letter No. 06-03 (Aug. 3, 2006) ("The monitoring period must be sufficient to demonstrate that the compensatory mitigation project has met performance standards, but not less than five years….Increased monitoring timeframes are usually needed for mitigation sites that take longer to develop and reach a level of stability.")

The National Research Council has also concluded that limited time periods for mitigation monitoring prevent an assessment of whether or not lost functions have been replaced: the "short time period within which forest restoration attempts have been monitored precludes an evaluation of their functional equivalency with natural reference systems."[8] As a result, "mitigation efforts cannot yet claim to have duplicated lost wetland functional values."[9]

Moreover, as noted above, monitoring for 5 years is not sufficient even to meet the single success criterion established by the plan. It is impossible to determine whether a particular tree density has been reached 10 years after original planting if monitoring stops after 5 years. Five years of monitoring is certainly not sufficient to ensure that the plan will produce a fully functioning floodplain forest that the report acknowledges will take at least 50 years to attain. As the U.S. Geological Survey points out, "several years will pass before the planted trees can provide the shade that many forest undergrowth plants [the presence of which is one indicator of successful bottomland hardwood reforestation] require for their survival."[10]

The plan should require mitigation monitoring until that monitoring establishes that an appropriate range of ecological success criteria have been met.

(4) The Plan Must Identify Specific Mitigation Lands And The Basis For The Corps' Determination That The Land And Interests Are Available For Acquisition – As Required By Law The Mitigation Lands Must Be Purchased Before Project Construction Begins

The plan requires purchase of 313 acres of floodplain agricultural land that has been cleared of trees. The lands must be adjacent to and hydraulically connected by seasonal surface flow to a river. Appendix J at 12. We understand that both the Minnesota and Wisconsin Departments of Natural Resources believe that identifying willing sellers of such lands will be difficult.

The entire mitigation plan rests on the Corps' ability to purchase the lands needed to carry out the mitigation from willing sellers. If the Corps cannot purchase the necessary lands, the

[8] *Restoration of Aquatic Ecosystems* at 311-312.
[9] *Fixing Compensatory Mitigation: What Will It Take* at 95 (summarizing findings in *Restoration of Aquatic Ecosystems).*
[10] *A Guide to Bottomland Hardwood Reforestation,* 67-69 at 68.

mitigation obviously will not be successful. It also is not possible to develop a detailed mitigation plan without knowing the current condition of the lands that will be used for mitigation.

To provide any reasonable basis for being able to determine whether the proposed mitigation plan is likely to succeed, the Corps must identify specific mitigation lands and provide a reasonable basis for the Corps' determination that the lands will be available for acquisition.

As discussed above, the mitigation lands must be purchased and the mitigation plan must be implemented before construction begins.

To meaningfully replace lost functions and values, mitigation should occur as close to the area impacted as possible. While the project will impact lands in both Wisconsin and Minnesota, the mitigation plan currently will target areas only in Wisconsin that are far from the impacted site ("Mitigation parcels will be in Pierce County, on or near a river or creek….Preference will be given to areas near Wisconsin DNR managed lands or US FWS managed lands.") Compensatory mitigation measures should be focused more directly within the Mississippi River floodplain of the project area.

(5) The Plan Must Include A Contingency Plan For Taking Corrective Actions In Cases In Which Monitoring Demonstrates That Mitigation Measures Are Not Achieving Ecological Success

The difficulties associated with successfully mitigating for impacts to forested wetlands requires contingency planning. The mitigation plan should establish a contingency plan for taking corrective actions in cases where monitoring shows that the original mitigation measures are not working. Contingency planning should establish contingencies for failure of any element of the original mitigation plan. For example, the mitigation plan offers no pro-active solutions to protect the restoration site from continued human impacts.

Once again, we appreciate the opportunity to comment on this project. We believe that it is imperative that the final EIS fully account for all project impacts associated with its construction and that the Corps modify the current mitigation plan to include necessary steps to maximize the chance of mitigation success.

If you have any questions regarding these comments, please feel free to contact me at (415) 482-8150 or Joyce Wu at (202) 347-7550.

Sincerely,

Melissa Samet
Senior Director, Water Resources
American Rivers

St. Paul District Responses to Comments by American Rivers
(letter dated October 13, 2006)

Comment:
American Rivers appreciates the opportunity to comment on the Draft General Reevaluation Report and Environmental Impact Statement for Lock and Dam 3, and is submitting the following comments for your consideration. By email dated October 4, 2006, we received an extension to submit comments by Friday, October 13, 2006.

American Rivers is a national conservation organization dedicated to protecting and restoring the nation's rivers and wetlands. American Rivers has more than 40,000 members across the country, including in the states of Minnesota and Wisconsin, and works in partnership with thousands of river and conservation organizations. American Rivers has a long history of working to ensure that Army Corps of Engineers (Corps) civil works projects reflect the highest scientific, economic, and environmental standards. We have extensive experience on Mississippi River issues, and actively participate in improving projects and promoting restoration that affect the Mississippi River.

The Draft General Reevaluation Report and Environmental Impact Statement understates impacts to significant aquatic resources. American Rivers urges the Corps to re-evaluate its impacts assessments. All project impacts should receive appropriate analysis in the final document in order to fulfill the Corps' legal mandate and stated commitment to protect the river environment, and to properly mitigate for any unavoidable impacts caused by project construction, operation, and maintenance. American Rivers also urges the Corps to strengthen its mitigation plan, and ensure that all mitigation for the project is implemented prior to project construction, as required by law.

Response:
We identified significant resources in the project area in consultation with stakeholders. We assessed the potential effects of project construction, operation and maintenance on those resources and have prepared an environmental mitigation plan.

Lock and Dam 3 was authorized by Congress as part of the Upper Mississippi River 9-Foot Channel Navigation Project in the River and Harbors Act of 1930. Project construction was completed in 1937. 33 USC § 2283 (a) does not apply to projects on which construction began on or before November 17, 1986.

Comment:
A. The final EIS must fully account for <u>all</u> project impacts

We believe that the EIS does not fully account for the impacts described below, and urge the Corps to conduct the necessary analyses to accurately assess those impacts:

1) Sections 7.2.6 and 7.2.8 of the main report state that impacts from spillway construction will have minimal impacts to aquatic life and recreational fishing. However, these conclusions contradict existing scientific literature and empirical knowledge about fish habitat uses in the Upper Mississippi River System. Constructing spillways using articulated concrete mat (ACM) will reduce habitat diversity and diminish fishing opportunities. Additionally, creating the 100-foot wide berm for the spillway will require excavating the existing shoreline and will result in dramatic losses of marsh and riparian forest between the river and Marsh Lake. Last, the GRR and EIS must address the loss of 400 feet of natural and riprap shoreline and upstream and downstream overflow sloughs, the effect on the underwater portion of the ACM stream bank, and the loss of a 2,500-foot littoral area comprised of coarse substrates, woody debris, and irregular contours.

Response:
The channel border aquatic habitat along the left descending bank below Lock and Dam 3 is a historically disturbed area. The shoreline was graded and riprapped during dam construction in 1937. Since then, the shoreline has eroded back, narrowing the lower embankment isthmus between the Gantenbein Lakes and the river (EIS Figure 3-9). The riprap has largely disappeared into the tailwater. The area close to the lock and dam and along the length of the lower embankment was severely scoured during the 1993 navigation accident that resulted in overtopping of the Wisconsin embankments when there was about 4 feet of head at the dam (EIS Figure 3-10). The channel border area downstream of the dam has eroded landward, leaving a sandy bench with a shoreline erosion scarp with exposed tree roots. Many floodplain trees along that shoreline have been lost to erosion and wind throw. The higher velocities in that area have swept most of the woody debris away, leaving a relatively homogeneous area without much hydraulic roughness. Fish have access to the irregularities of the present bank line and the emerging woody debris during higher levels of river discharge.

The raised embankment area near the dam would be armored with large diameter riprap. The spillway areas would have ACM extending to the toe of the bank slope under water and would be anchored with large diameter riprap there. The areas near the Marsh Lake and Gantenbein Lake water control structures would also be armored with riprap.

We proposed using ACM on the spillways rather than riprap to provide a more environmentally acceptable design. We have considered the feasibility of ending the ACM 5 feet under water, and continuing down the slope with riprap. Keying in the ACM on a slope and building downward with riprap could be difficult to construct underwater, it could result in greater disturbance of the adjacent mussel bed, and it could be more costly than using ACM down the slope with riprap to secure it at the toe of the slope. We will examine this design issue further during development of the design documentation report.

The underwater portions of the ACM and the large diameter riprap at the toe of the ACM would provide hydraulic roughness. The ACM would be blocks with interstitial spaces between them and holes in them, providing considerable area of hard substrate for attachment of benthic macroinvertebrates and some shelter for small fish. Unlike the larger-sized ACM blocks used on the Lower Mississippi River, the ACM proposed for use at Lock and Dam 3 would have smaller blocks, more roughness, more surface area and more interstitial spaces.

The ACM on the Lower Mississippi River was found to support a diverse community of benthic macroinvertebrates (Way et al. 1995, Wright 1982, Cobb and Magoun 1985, and Lowery et al. 1987). Rock riprap placed for the embankments construction would also support a diverse community of benthic macroinvertebrates and would provide shelter for fish (Anderson et al. 1983).

Due to the limited opportunities to provide functional mitigation features for channel border habitat in a cost effective manner, the amount of bottomland forest restoration was increased to provide out of kind mitigation for the 20 acres of channel border habitat affected by construction. The relative habitat value losses associated with the aquatic habitat were included in the HEP analysis (Table 3 of the Mitigation Plan) and resulted in the need to acquire and restore approximately 93 acres of bottomland hardwood forest.

In addition to the floodplain forest restoration compensatory mitigation, we propose to anchor large woody debris (whole trees) under water along the ACM spillways to provide additional

hard substrate, hydraulic diversity and habitat for fish. We will consult with the WDNR and the MDNR on design of the woody debris installation on the ACM spillways during development of the Design Documentation Report.

Comment:
2) The Corps has not properly assessed the impacts of the closure dike that ties the guide wall extension to the riverbank shoreline. This component of the project will result in substantial losses of aquatic habitat, which will require mitigation.

Response:
A berm connecting the end of the guide wall with the Minnesota riverbank would fill approximately 1.5 acres. The berm is needed to prevent woody debris from accumulating on the landward side of the extended guide wall. Approximately 0.5 acre of this berm would be emergent, converting aquatic habitat to terrestrial. The area is presently deep high current velocity channel border aquatic habitat in the immediate lock approach with sand bottom and riprapped bank. The area is used little by the public except for boaters navigating into or out of the lock. The side slopes of the berm would be armored with rock. The emergent part of the berm would grow up with willows.

The pattern of current velocity would be changed by the channel modifications, directing more flow toward the gated part of the dam and reducing velocities in the lock approach. The net effects on channel habitat would be to convert 17 acres of deep channel high current velocity sand bottom habitat to deep channel rock bottom habitat with somewhat lower current velocities. The 17 acres of rock substrate in the lock approach would provide hard substrate for crayfish and a variety of filter-feeding macroinvertebrates like Hydropsychid caddisflies, which are important fish food organisms. Production of macroinvertebrates is expected to increase. The rock substrate would provide microhabitat shelter from the current for fish like darters, rock bass and smallmouth bass. Extensive mussel surveys in the project area upstream of Lock and Dam 3 found very few native mussels.

Avoid and minimize measures would include dredging and rock placement to be done during the non-navigation season to limit disturbance to walleye and sauger that spawn in the tailwater in the spring.

Because no losses of significant resources would result and because the habitat changes associated with the channel modifications would increase production of benthic macroinvertebrates in the area, no compensatory mitigation is proposed for the navigation safety improvement portion of the project.

Comment:
3) The location of the staging area and avoidance and minimization measures for construction of upstream spot dikes is not referenced in the draft document.

Response:
A staging area for construction of the spot dikes will not be needed. The work will be accessed from land via a one-lane trail. We mention avoid and minimize measures to protect cultural resources in the parking/turning area at the base of the bluff in Section 7.1.8 of the draft GRR/EIS. These measures were coordinated with the Wisconsin State Historic Preservation Officer. We added another avoid and minimize measure, to install silt curtains in the spot dike

channels during construction to limit sediment transport into Marsh Lake and the Mississippi River.

Comment:
4) On page 5 of Appendix J, the mitigation plan asserts that “[b]ecause no unavoidable losses of significant resources would result [from navigation improvements], and because the habitat changes associated with the channel modifications would increase production of benthic macroinvertibrates in the area, no compensatory mitigation is proposed for the navigation safety improvement portion of the project." American Rivers strongly disagrees with the assumption that proposed measures for navigation safety improvements will not have any unavoidable losses of significant resources. Central features of the navigation safety measures include dredging to deepen 30 acres of the main channel, filling 17 acres of the lock approach and filling 1.5 acres of the Minnesota riverbank for a berm. By removing the bottoms of rivers, lakes, and other bodies of water that serve as habitat for bottom-dwelling organisms, dredging clearly causes environmental harm. Dredging can also remove or damage aquatic biota and disrupt sedimentary structures. Furthermore, dredging can resuspend sediment into water, leading to a number of other consequences, particularly if the dredged sediment is contaminated with toxic substances. The disposal of the dredged material also causes its own set of significant environmental harm.

Response:
We conducted bathymetric, substrate type, and mussel surveys and sampled and analyzed sediment in the area above Lock and Dam 3 proposed for channel modifications. The area is deep sand bottom channel habitat with high current velocity. The substrate is lacking in structure, there is very little woody debris, macroinvertebrates are scarce and there are almost no native mussels present. We stated that the dredging and material placement will kill macroinvertebrates that are there, but that the macroinvertebrate community that will rapidly colonize the rock placed in the lock approach and would result in a net increase in aquatic life in that area. The sediment to be dredged is sand with low percent fines and very low concentrations of contaminants. The States agree that the dredging should not result in unacceptable mobilization of contaminants. We added discussion on the sediment resuspension that would occur during dredging and material placement to the EIS and the Section 404(b) Clean Water Act Evaluation (Appendix C).

Comment:
The EIS and GRR provide no scientific support for the claim that ACM serves as an adequate substitute for natural habitat for benthic macroinvertebrates. The Corps should provide scientific support for this claim. If sufficient scientific support to justify this conclusion does not exist, the Corps must identify the amount of damage caused by these features and propose mitigation to address those damages.

Response:
We provided additional information about the ACM in the EIS (see response above).

We included the channel border area affected by embankments construction in the mitigation planning.

Comment:
5) On page 5 of Appendix J, the mitigation plan states that the potential placement of excavated material on the meander scrolls in Marsh Lake would contribute to floodplain reforestation, and therefore would not require mitigation. We are unaware of any scientific

evidence that could support this claim, and similar attempts at other projects have not yielded satisfactory results.

Response:
Marsh Lake is an impounded floodplain lake. After more than 40 years of elevated water levels, many trees have died. One ecosystem restoration measure that would allow flood-intolerant trees to grow in regulated river floodplains is to raise areas of the floodplain and plant native trees. Although the landowners requested and we originally proposed this as a means to dispose of material excavated for the embankments construction, the WDNR cannot allow it for regulatory reasons, and it is not currently proposed. Material excavated from the embankments construction would be disposed at an upland site.

Comment:
6) According to table 1 (Appendix J at 5), the E5 plan would impact a total of 87.36 acres of habitat, 65.7 acres of which are forested floodplain. The mitigation plan later states that over 20 acres of habitat will not be mitigated for, "[g]iven the limited effect on other habitat types within the project area and the limited opportunities to provide functional mitigation features for channel border aquatic habitat in a cost effective manner." Appendix J at 8.

The decision not to mitigate for these impacts is unacceptable for three reasons. First, the determination that 20 acres of affected habitat constitutes "limited" impacts is arbitrary and not scientifically sound. Second, underestimating mitigation needs for planning efficiency is contrary to the Corps' stated goal of mitigating for all impacts cause by project construction, operation, and maintenance. Third, mitigation is not to be based on cost-efficiency determinations. Mitigation is required whenever a project will produce more than negligible impacts. 33 U.S.C. § 2283(d). Cost-efficiency is not a factor in that assessment. Moreover, "the benefits attributable to measures included in a project for the purpose of environmental quality, including improvement of the environment and fish and wildlife enhancement, shall be deemed to be at least equal to the costs of such measures." 33 U.S.C. § 2284.

Wetlands and instream habitat provide a host of ecosystem services, including floodwater storage, clean water, and habitat for the majority of species. In order to preserve these vital functions for the benefit of local communities, fish, and wildlife, mitigation plans must fully account for <u>all</u> impacts from project construction, operation, and maintenance.

Response:
We included the channel border area affected by construction in the mitigation planning. Because of the limited opportunities to provide functional mitigation features for channel border habitat in a cost effective manner, the amount of bottomland forest restoration was increased to provide out of kind mitigation for the 20 acres of channel border habitat affected by construction. The relative habitat value losses associated with the aquatic habitat was included in the HEP analysis (Table 3 of the Mitigation Plan) and resulted in the need to acquire and restore approximately 93 acres of bottomland hardwood forest.

In addition to the floodplain forest restoration, we propose to anchor large woody debris (whole trees) under water along the ACM spillways to provide additional hard substrate, hydraulic diversity and habitat for fish.

Comment:
B. Mitigation Must Be Carried Out Prior To Project Construction

The law is clear that mitigation for civil works projects must be carried out prior to or concurrently with project construction:

> "Steps to be taken prior to or concurrently with construction.
>
> (1) In the case of any water resources project which is authorized to be constructed by the Secretary before, on, or after the date of enactment of this Act [enacted Nov. 17, 1986], construction of which has not commenced as of the date of enactment of this Act [enacted Nov. 17, 1986], and which necessitates the mitigation of fish and wildlife losses, including the acquisition of lands or interests in lands to mitigate losses to fish and wildlife, as a result of such project, such mitigation, including acquisition of the lands or interests--
>
> (A) shall be undertaken or acquired before any construction of the project (other than such acquisition) commences, or
>
> (B) shall be undertaken or acquired concurrently with lands and interests in lands for project purposes (other than mitigation of fish and wildlife losses),
>
> whichever the Secretary determines is appropriate, except that any physical construction required for the purposes of mitigation may be undertaken concurrently with the physical construction of such project."

33 U.S.C. § 2283 (a). Because lands and interests in lands needed for the project must be acquired before project construction can begin (approximately 395 acres of land exclusive of the mitigation lands must be purchased for the project), mitigation lands for the project also must be purchased before project construction begins. The mitigation plan also must be implemented before construction begins.

The Corps should clearly state that it will implement mitigation for this project before construction begins in any final Record of Decision for the project. The Corps should also ensure that specific mitigation lands and any actions needed to acquire those lands are identified in its mitigation plan for the project.

Response:
We are required and intend to do the real estate acquisition and implement floodplain forest restoration for mitigation before or concurrently with construction. We do not have the authority or the funding to do any real estate work prior to having an approved report and funding for construction.

Comment:
C. The Proposed Mitigation Plan Must Be Strengthened

As currently written, the proposed mitigation plan calls for restoring 313 acres of former floodplain forest that had been converted to agricultural land to mitigate for unavoidable impacts to significant resources caused by strengthening the Wisconsin embankments. Appendix J at 12-13. The Corps acknowledges that no mitigation is included for impacts to habitat types other than bottomland hardwood forest that lie within the construction disturbance footprint. Appendix

J at 8. Mitigation must be undertaken to account for all project impacts, and we urge the Corps to ensure that all impacts are accurately identified (see discussion above).

As importantly, we urge the Corps to revise its mitigation plan to include the five items discussed in detail below. These changes are needed to improve the likelihood of mitigation success in light of the difficulties associated with successfully mitigating damages to wetlands and other aquatic habitats.

An extensive body of scientific literature demonstrates that wetlands mitigation is extremely difficult, and often fails. For example, one 1996 study published in *Ecological Applications* concludes that "[b]ased on over a decade of survey results, the cumulative record of past mitigation projects remains undeniably poor overall, with disappointingly few examples of success."[11] The "sober reality [is] that under present mitigation policies and practices 'losses are likely to be uncompensated for and that what we call mitigation has a high chance of failure.'"[12]

Mitigation for bottomland hardwood forests is no exception. The National Research Council reports that:

> Attempts to restore forested wetlands of the Southeast (e.g., bottomland hardwoods and cypress swamps) have encountered difficulties related to the time required to replace mature trees, the lack of material to transplant, the lack of knowledge of how and when to carry out seeding or transplantation, (Clewell and Lea, 1989) and altered hydrology (drainage for conversion to agriculture) of the wetland area.[13]

Because lost wetland functions are so difficult to re-establish, it is essential that the mitigation plan include each of the following key elements that will maximize the chance of successfully replacing lost the habitat values and functions as a result of the project.

(1) The Plan Must Fully Describe The Types And Amount Of Restoration Activities To Be Conducted And The Resource Functions And Values That Will Result From Those Activities

The plan should fully describe the amount and type of restoration activities that will be carried out. For example, while the plan mentions the need to restore the hydrologic regime of the mitigation site, the plan provides virtually no details on how this will happen or what resource values will be addressed by the hydrologic modifications.[14] Of the 13 plan details provided, 10 address only reforestation efforts (these include directions for the types of seedlings to be used, herbicide applications, tree density, and monitoring for tree survival). Even these details, however, provide little, if any, assurance that the plan will produce a mature and fully functioning bottomland hardwood wetland in 50 years.

---

[11] Margaret S. Race and Mark S. Fonesca, *Fixing Compensatory Mitigation: What Will It Take*, Ecological Applications (1996) pp. 94-101 at 97.

[12] *Id*.

[13] National Research Council, *Restoration of Aquatic Ecosystems*, (National Academy Press 1992) at 311.

[14] We recognize that without having identified mitigation sites, developing a plan for restoring the hydrological regime is impossible. This is another reason why mitigation lands must be identified – and purchased – before project construction.

The mitigation plan should identify lands that are available for carrying out the mitigation, and outline a plan that specifically addresses the necessary steps to restore the hydrologic functions of those lands. Hydrological modification is a critical component of successful wetlands restoration efforts. The plan also needs to identify any steps that will be needed to ensure that the restored site will achieve the appropriate level of species diversity. As the National Research Council has concluded, correct hydrology and species diversity are critical elements in restoring wetlands:

> Natural forested wetlands may support hundreds of plant species, many of which thrive in the understory (91 percent of 409 species in one riverine forest were understory species). Old-growth forests are dominated by trees that gradually achieve a dominant role in the canopy and that are self-sustaining through their ability to reproduce in their own shade. It is not clear that such climax species can be successfully established in open sites, or whether their introduction must await development of seral (intermediate successional stage) plant communities. . . . In many cases, restoration of suitable hydrologic conditions will be necessary.[15]

Appendix J states that the "floodplain forest in the affected area has mature native trees, including silver maple, green ash, black willow, and cottonwood. Some swamp white and red oaks are on the highest floodplain ground." Appendix J at 6. While the plan calls for planting some of each of these species, there is no final ecological goal for species diversity, and no plan elements that will assure the appropriate diversity. Moreover, there will be no way to tell if the appropriate diversity is being (or has been) achieved since the mitigation will be monitored for only 5 years. What happens, for example, if the seedlings are wiped out in year 6?

Appendix J also states that the "floodplain forest in the project area produces considerable leaf litter and woody debris, which contributes particulate organic matter to the aquatic ecosystem." Appendix J at 6. This woody debris provides important habitat as do the larger trees in the project area. It is not at all clear, however, how the proposed plan will result in the replacement of these lost functions. And there clearly is no way to tell if these functions will be replaced with only a 5 year monitoring plan.

In addition to addressing these issues, the plan should describe the wetland habitat and functional values that will be replaced through the mitigation, and the actions needed to achieve replacement of those lost functions and values. For example, the plan should describe how it will replace the short-term water storage, long-term water storage, water velocity reduction, sediment detention, onsite erosion control, nutrient and dissolved substance removal, and organic carbon export values of the destroyed wetlands.

Without having more details – including details on steps that will be needed to reestablish the necessary hydrologic regime – there is no way to determine whether the necessary steps will be taken to ensure successful mitigation. There is also no way to determine the likelihood of success of the proposed mitigation efforts.

(2) The Plan Must Establish Specific Ecological Success Criteria Beyond Tree Density Against Which Mitigation Success Will Be Measured

[15] *Restoration of Aquatic Ecosystems* at 311.

Scientists have long known that when monitoring to assess the success of mitigation is based on a relatively simple set of criteria, those criteria may or may not accurately reflect wetland function.[16] The proposed plan does not even propose a simple set of criteria for evaluating success. Instead it proposes only a single criterion – attaining a target average of 108 trees per acre over planted area 10 years after the initial planting. Moreover, there will be no way to determine whether even this goal has been achieved since mitigation monitoring will last for only 5 years. Appendix J at 19.

This single criterion is completely inadequate as an indicator of whether the mitigation plan has successfully mitigated a mature bottomland hardwood wetland forest. To mitigate for lost wetlands, the Corps must create, restore, or enhance wetland acres, functions and values. Attainment of a certain tree density does nothing to ensure replacement of lost wetland functions and values, which include short-term water storage, long-term water storage, water velocity reduction, sediment detention, onsite erosion control, nutrient and dissolved substance removal, and organic carbon export. The mitigation plan should include specific ecological success criteria in addition to tree density that will be measured to determine whether the lost functions and values of the destroyed wetlands are being replaced.

While the "mitigation area objectives" in Appendix J could provide some additional success criteria, these objectives are not included in the actual mitigation plan. *Compare* Appendix J "mitigation area objectives" at pages page 12-13 to Appendix J "restoration plan for the mitigation site(s)" at pages 18-19. And even if the "mitigation area objectives" were included as specific plan elements, they would not ensure replacement of the lost wetland functions and values discussed above.

Other criteria that could be used to determine ecological success include, but should not be limited to: species diversity, such as the diversity of bird communities; the establishment of undergrowth vegetation; indicators of plant health; and water quality measurements, including pH, alkalinity, dissolved oxygen, nitrogen, phosphorus, turbidity, suspended solids, the presence of heavy metals, and salinity, among others.[17]

(3) The Plan Must Require Monitoring Until Mitigation Success Is Established And Must Clearly Identify The Entity Responsible For Monitoring

The Corps is legally obligated to implement all the mitigation committed to in a Record of Decision. E.g., 40 C.F.R. § 1505.3; 33 C.F.R § 230.15. To help ensure such implementation, both the Council on Environmental Quality and Corps regulations require the Corps to monitor its mitigation requirements to ensure that they are properly carried out. 40 C.F.R. §§ 1505.2, 1505.3; 33 C.F.R. §230.15. Indeed, the Corps' regulations define monitoring as "that level of oversight activity necessary to ensure that the decision, including required mitigation measures, is implemented." 33 C.F.R. § 230.15.

The Corps has recognized that mitigation monitoring will typically require more than five years, particularly for mitigation that takes longer to develop and reach a level of stability. Regulatory

---

[16] William J. Mitsch and Renee F. Wilson, *Improving the Success of Wetland Creation and Restoration With Know-How, Time, and Self-Design,* Ecological Applications (1996) pp. 77-83 at 77.

[17] See Mississippi State University's Department of Wildlife and Fisheries Research webpage at http://www.cfr.msstate.edu/fwrc/wildlife/bird.htm. U.S. Geological Survey, *A Guide to Bottomland Hardwood Reforestation*, Information and Technology Report USGS/BRD-2001-0011 (Revised 2004) at 67-69 at 67, 78-85.

Guidance Letter No. 06-03 (Aug. 3, 2006) ("The monitoring period must be sufficient to demonstrate that the compensatory mitigation project has met performance standards, but not less than five years….Increased monitoring timeframes are usually needed for mitigation sites that take longer to develop and reach a level of stability.")

The National Research Council has also concluded that limited time periods for mitigation monitoring prevent an assessment of whether or not lost functions have been replaced: the "short time period within which forest restoration attempts have been monitored precludes an evaluation of their functional equivalency with natural reference systems."[18] As a result, "mitigation efforts cannot yet claim to have duplicated lost wetland functional values."[19]

Moreover, as noted above, monitoring for 5 years is not sufficient even to meet the single success criterion established by the plan. It is impossible to determine whether a particular tree density has been reached 10 years after original planting if monitoring stops after 5 years. Five years of monitoring is certainly not sufficient to ensure that the plan will produce a fully functioning floodplain forest that the report acknowledges will take at least 50 years to attain. As the U.S. Geological Survey points out, "several years will pass before the planted trees can provide the shade that many forest undergrowth plants [the presence of which is one indicator of successful bottomland hardwood reforestation] require for their survival."[20]

The plan should require mitigation monitoring until that monitoring establishes that an appropriate range of ecological success criteria have been met.

(4) The Plan Must Identify Specific Mitigation Lands And The Basis For The Corps' Determination That The Land And Interests Are Available For Acquisition – As Required By Law The Mitigation Lands Must Be Purchased Before Project Construction Begins

The plan requires purchase of 313 acres of floodplain agricultural land that has been cleared of trees. The lands must be adjacent to and hydraulically connected by seasonal surface flow to a river. Appendix J at 12. We understand that both the Minnesota and Wisconsin Departments of Natural Resources believe that identifying willing sellers of such lands will be difficult.

The entire mitigation plan rests on the Corps' ability to purchase the lands needed to carry out the mitigation from willing sellers. If the Corps cannot purchase the necessary lands, the mitigation obviously will not be successful. It also is not possible to develop a detailed mitigation plan without knowing the current condition of the lands that will be used for mitigation.

To provide any reasonable basis for being able to determine whether the proposed mitigation plan is likely to succeed, the Corps must identify specific mitigation lands and provide a reasonable basis for the Corps' determination that the lands will be available for acquisition.

As discussed above, the mitigation lands must be purchased and the mitigation plan must be implemented before construction begins.

To meaningfully replace lost functions and values, mitigation should occur as close to the area

[18] *Restoration of Aquatic Ecosystems* at 311-312.
[19] *Fixing Compensatory Mitigation: What Will It Take* at 95 (summarizing findings in *Restoration of Aquatic Ecosystems).*
[20] *A Guide to Bottomland Hardwood Reforestation,* 67-69 at 68.

impacted as possible. While the project will impact lands in both Wisconsin and Minnesota, the mitigation plan currently will target areas only in Wisconsin that are far from the impacted site ("Mitigation parcels will be in Pierce County, on or near a river or creek….Preference will be given to areas near Wisconsin DNR managed lands or US FWS managed lands.") Compensatory mitigation measures should be focused more directly within the Mississippi River floodplain of the project area.

(5) The Plan Must Include A Contingency Plan For Taking Corrective Actions In Cases In Which Monitoring Demonstrates That Mitigation Measures Are Not Achieving Ecological Success

The difficulties associated with successfully mitigating for impacts to forested wetlands requires contingency planning. The mitigation plan should establish a contingency plan for taking corrective actions in cases where monitoring shows that the original mitigation measures are not working. Contingency planning should establish contingencies for failure of any element of the original mitigation plan. For example, the mitigation plan offers no pro-active solutions to protect the restoration site from continued human impacts.
Once again, we appreciate the opportunity to comment on this project. We believe that it is imperative that the final EIS fully account for all project impacts associated with its construction and that the Corps modify the current mitigation plan to include necessary steps to maximize the chance of mitigation success.

Response:
We agree that many ecological functions and values make floodplain forests unique and that restoration of the hydrologic regime is an essential part of restoration of floodplain forest. The restoration plan for the mitigation area(s) was prepared by foresters in the St. Paul District Natural Resources Management office in La Crescent, Minnesota. The plan includes measures to restore the hydrologic regime and geomorphic features on the mitigation land if necessary and floodplain forest restoration measures that are proven to be effective on the Upper Mississippi River.

We cannot describe the specific measures for restoring the geomorphic features and hydrologic regime for any particular site until we have the specific mitigation properties identified. We need an approved report and funding to proceed with construction prior to real estate acquisition for mitigation.

We implement compensatory environmental mitigation in the same State where the construction occurs. In the mitigation plan, we state that we intend to acquire mitigation land in floodplain areas nearby in Pierce County, Wisconsin, that are in need of restoration. Some landowners have already indicated interest in selling floodplain land in southern Pierce County. If suitable property is available from willing sellers in the Mississippi River floodplain near the project area, then that may be acquired.

We modified the mitigation plan to include a restoration objective for tree community composition as well as for stand density. We extended the monitoring period, with replanting to be done if necessary to attain the restoration objectives for tree density (average of 108 trees >2 inches DBH at year 10) and composition (at least 10 percent hackberry and swamp white oak) at year 10. We extended the monitoring program and management to maintain those objectives over time, with replanting as needed. The Corps of Engineers would retain ownership of the mitigation land and would have management responsibility for it in perpetuity. The St. Paul District may enter into an outgrant agreement with the Wisconsin Department of

Natural Resources to manage it as a wildlife management area with public access for non-motorized recreational activities.

Inevitably on a forest restoration project, the age distribution of trees will be fairly even. However, 20 percent of the mitigation land, interspersed with the planted areas, will be allowed to revegetate naturally from local propagules, which should provide some additional successional and species diversity.

References

Anderson, D. D., D. B. Wilcox, and D. R. McConville. 1983. Physical and Biological Investigations of the Main Channel Border Habitat of Pool 5a on the Upper Mississippi River in 1980. 2 vols. U.S. Army Corps of Engineers, St. Paul District, St. Paul, Minnesota. 251 p.

Cobb, S.P. and A.D. Magoun. 1995. Physical and Hydrologic Characteristics of Aquatic Habitat Associated with Dike Systems in the Lower Mississippi River, River Mile 320 to 610. Lower Mississippi River Environmental Program, Report 5, Mississippi River Commission, Vicksburg, Mississippi.

Lowry, D. R., M.P. Taylor, R.L. Warden and F.H. Taylor. 1987. Fish and Benthic Communities at Eight Lower Mississippi River Flood-Plain Lakes. Lower Mississippi River Environmental Program, Report 6, Mississippi River Commission, Vicksburg, Mississippi.

Way, C.M., A.J. Burky, C.R. Bingham, and A.C. Miller. 1995. Substrate Roughness, Velocity Refuges, and Macroinvertebrate Abundance on Artificial Substrates in the Lower Mississippi River**.** Journal of the North American Benthological Society*,* Vol. 14, No. 4, pp. 510-518.

UPPER MISSISSIPPI WATERWAY ASSOCIATION
INCORPORATED 1932
P.O. Box 7006
St. Paul, Minnesota 55107
651-776-3108
651-774-7049 FAX
umwa@qwest.net
Dedicated to navigation and sound water resource management

October 6, 2006

St. Paul District
U.S. Army Corps of Engineers
ATTN: Mr. Daniel Wilcox, CEMVP-PM-E
190 Fifth Street East, STE 401
St. Paul, MN 55101

Subject: Draft Integrated General Reevaluation Report and Environmental Impact Statement for Lock and Dam 3 Mississippi River Navigation Safety and Embankments.

Dear Mr. Wilcox:

UMWA supports recommended guide wall extension, channel modifications and strengthening Wisconsin embankments with phased construction, as extensively discussed in the Report and as proposed in Chapter 10.2 Recommendations.

Extended guide wall and channel modifications

Lock and Dam 3 was constructed on a bend in the river and with an experimental set of embankments on the Wisconsin side to avoid inundating areas of high quality floodplain wetland habitat in the Cannon River Bottoms in Minnesota and the Gantenbein Lakes area in Wisconsin. This bend-in-the-river location results in an outdraft current that flows across the upstream approach to the lock and pulls vessels toward the gated part of the dam. This outdraft current makes downbound navigation difficult for commercial tows and for the 20,000 recreational boats that pass through this lock annually. Hydraulic model simulations revealed that a combination of an extended guide wall and channel modifications offers a promising alternative to improve navigation safety at Lock and Dam 3.

Strengthened Wisconsin embankments with phased construction

Lock and Dam 3 was ranked number 2 nationally among navigation projects with the highest risk of failure. The 2005 Screening Portfolio for Risk Assessment of Dams (SPRA) noted that Lock and Dam 3 was ranked highly vulnerable because of the deteriorated condition of the Wisconsin embankments and the significant adverse environmental and economic consequences of embankments failure and an accidental drawdown of Pool 3. A breach through the Wisconsin embankments could result in a rapid accidental drawdown of Pool 3 of between 2 to 6 feet depending on the size of the breach. An accidental drawdown would force closure of the navigation channel, recreational boating and the shutdown of two (one nuclear and one non-nuclear) generating plants thereby removing about 40 percent of the electricity used in the Minneapolis-St. Paul Metropolitan Area.

UPPER MISSISSIPPI WATERWAY ASSOCIATION
INCORPORATED 1932
P.O. Box 7006
St. Paul, Minnesota 55107
651-776-3108
651-774-7049 FAX
umwa@qwest.net
Dedicated to navigation and sound water resource management

River ecosystem

Failure of the upper embankment would flood Marsh and Gantenbein Lakes by 1 foot and 2 feet respectively, killing much of the submersed aquatic vegetation and floodplain forest, resulting in deeper floodplain lakes, dominated by blue-green algae, with much fewer aquatic plants. This change in ecosystem state would markedly decline use by migrating waterfowl and resident wildlife.

In conclusion, we would urge a reduced construction footprint by using waterside construction resources whenever possible in order to preserve critical environmental properties, both landward and in shallow water.

Sincerely,

Richard Kreider
President

C:\UMWA\COE\Lock&Dam3\2006_October_draft comments.doc

St. Paul District Responses to Comments by the Upper Mississippi Waterway Association
(letter dated October 6, 2006)

Comment:
UMWA supports recommended guide wall extension, channel modifications and strengthening Wisconsin embankments with phased construction, as extensively discussed in the Report and as proposed in Chapter 10.2 Recommendations.

Extended guide wall and channel modifications
Lock and Dam 3 was constructed on a bend in the river and with an experimental set of embankments on the Wisconsin side to avoid inundating areas of high quality floodplain wetland habitat in the Cannon River Bottoms in Minnesota and the Gantenbein Lakes area in Wisconsin. This bend-in-the river location results in an outdraft current that flows across the upstream approach to the lock and pulls vessels toward the gated part of the dam. This outdraft current makes downbound navigation difficult for commercial tows and for the 20,000 recreational boats that pass through this lock annually. Hydraulic model simulations revealed that a combination of an extended guide wall and channel modifications offers a promising alternative to improve navigation safety at Lock and Dam 3.

Strengthened Wisconsin embankments with phased construction
Lock and Dam 3 was ranked number 2 nationally among navigation projects with the highest risk of failure. The 2005 Screening Portfolio for Risk Assessment of Dams (SPRA) noted that Lock and Dam 3 was ranked highly vulnerable because of the deteriorated condition of the Wisconsin embankments and the significant adverse environmental and economic consequences of embankments failure and an accidental drawdown of Pool 3. A breach through the Wisconsin embankments could result in a rapid accidental drawdown of Pool 3 of between 2 to 6 feet depending on the size of the breach. An accidental drawdown would force closure of the navigation channel, recreational boating and the shutdown of two (one nuclear and one non-nuclear) generating plants thereby removing about 40 percent of the electricity used in the Minneapolis-St. Paul Metropolitan Area.

River ecosystem
Failure of the upper embankment would flood Marsh and Gantenbein Lakes by 1 foot and 2 feet respectively, killing much of the submersed aquatic vegetation and floodplain forest, resulting in deeper floodplain lakes, dominated by blue-green algae, with much fewer aquatic plants. This change in ecosystem state would markedly decline use by migrating waterfowl and resident wildlife.

In conclusion, we would urge a reduced construction footprint by using waterside construction resources whenever possible in order to preserve critical environmental properties, both landward and in shallow water.

Response:
We agree. Construction of the upper embankment spot dikes will be mainly accessed from land, given the existing access trail and the location of the spot dikes away from the riverbank. Material and equipment may be brought in by water for this work.

Work on the lower embankment, the channel modifications, and the guide wall extension would be done from the water.